

Twin countershaft transmission, all synchronized

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1、 Main parameters of Twin countershaft transmission, all synchronized

1.1 Main section picture of the twin countershaft transmission, all synchronized

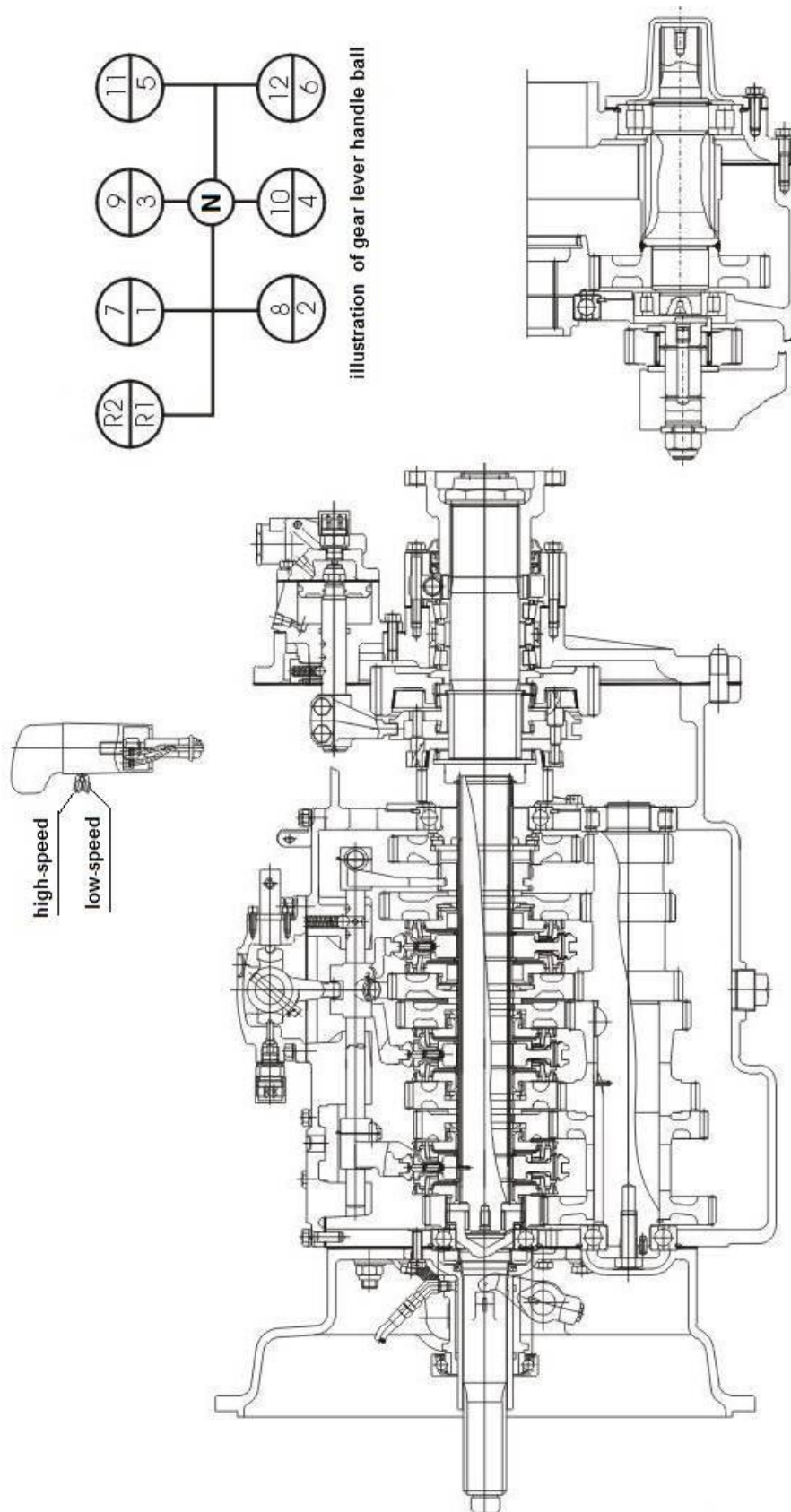


Figure 1 Main section picture of the twin countershaft transmission, all synchronized

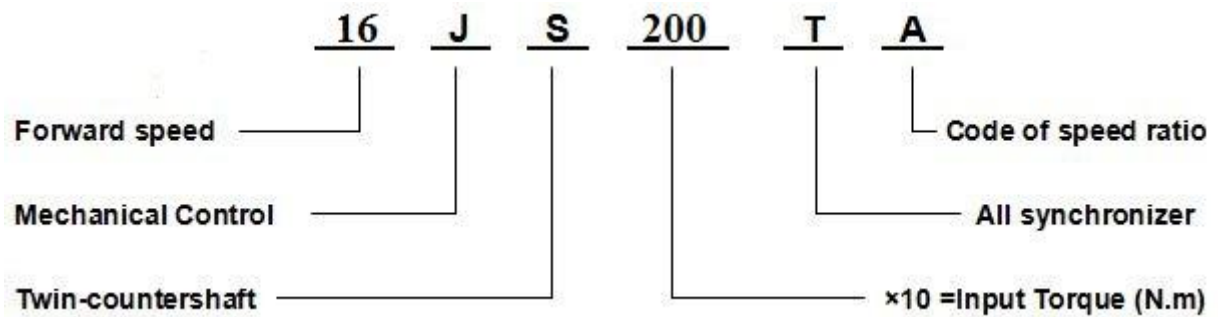
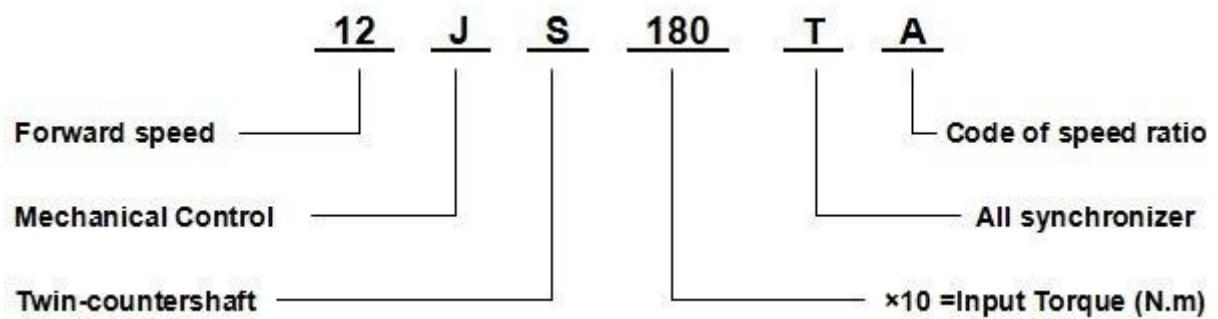
1.2 Main parameters of Twin countershaft transmission, all synchronized

Performance parameter

Transmission type	rating input power (kw)	rating input torque (N.m)	max input speed (rpm)	weight (kg)	length (mm)	oiling quantity (L)
16JS180T	331	1800	2600	350	983.5	19
16JS180TA	331	1800	2600	350	983.5	19
16JS200T	355	2000	2600	350	983.5	19
16JS200TA	355	2000	2600	350	983.5	19
16JS240T	400	2400	2600	350	983.5	19
16JS240TA	400	2400	2600	350	983.5	19
12JS160T	285	1600	2600	350	968.5	17
12JS160TA	285	1600	2600	350	968.5	17
12JS180T	331	1800	2600	360	983.40	18.5
12JS180TA	331	1800	2600	360	983.40	18.5
12JS200T	331	2000	2600	380	983.40	18.5
12JS200TA	331	2000	2600	380	983.40	18.5
12JS240T	400	2400	2600	380	983.40	18.5
12JS240TA	400	2400	2600	380	983.40	18.5
8JS100T-B	199	1000	2600	323	821.30	15.0
8JS100TA-B	199	1000	2600	323	821.30	15.0
8JS118T-B	220	1180	2600	320	939.8	15
8JS118TA-B	220	1180	2600	320	939.8	15
8JS118TB-B	220	1180	2600	320	939.8	15
8JS118TC-B	220	1180	2600	320	939.8	15
8JS130T-B	243	1300	2600	323	821.30	15
8JS130TA-B	243	1300	2600	323	945.30	15.5
8JS180T-B	331	1800	2600	370	945.30	15.5
8JS180TA-B	331	1800	2600	370	945.30	15.5
9JS119T-B	220	1190	2600	280	945.30	13
9JS119TA	220	1190	2600	280	945.30	13
9JS135T-B	243	1350	2600	280	945.30	13
9JS135TA	243	1350	2600	280	945.30	13
9JS150T-B	265	1500	2600	280	939.8	14
9JS150TA-B	265	1500	2600	280	939.8	14
9JS165T	295	1650	2600			
9JS200T	355	2000	2600	350	933.3	16
9JS200TA	355	2000	2600	350	933.3	16
9JS200TC	355	2000	2600	350	933.3	16

Type		Ratio																		
		crawl gear	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	R1	R2
16JS180T		/	17.04	14.03	11.66	9.60	8.06	6.64	5.53	4.55	3.74	3.08	2.56	2.11	1.77	1.46	1.21	1.00	16.30	13.42
16JS180TA		/	14.03	11.64	9.60	7.97	6.64	5.51	4.55	3.78	3.08	2.56	2.11	1.75	1.46	1.21	1.00	0.83	13.42	11.13
16JS200T		/	17.04	14.03	11.66	9.60	8.06	6.64	5.53	4.55	3.74	3.08	2.56	2.11	1.77	1.46	1.21	1.00	16.30	13.42
16JS200TA		/	14.03	11.64	9.60	7.97	6.64	5.51	4.55	3.78	3.08	2.56	2.11	1.75	1.46	1.21	1.00	0.83	13.42	11.13
16JS240T		/	17.04	14.03	11.66	9.60	8.06	6.64	5.53	4.55	3.74	3.08	2.56	2.11	1.77	1.46	1.21	1.00	16.30	13.42
16JS240TA		/	14.03	11.64	9.60	7.97	6.64	5.51	4.55	3.78	3.08	2.56	2.11	1.75	1.46	1.21	1.00	0.83	13.42	11.13
12JS160T		/	15.53	12.08	9.39	7.33	5.73	4.46	3.48	2.71	2.10	1.64	1.28	1.00	/	/	/	/	14.86	3.33
12JS160TA		/	12.10	9.41	7.31	5.71	4.46	3.48	2.71	2.11	1.64	1.28	1.00	0.78	/	/	/	/	11.56	2.59
12JS180T		/	15.53	12.08	9.39	7.33	5.73	4.46	3.48	2.71	2.10	1.64	1.28	1.00	/	/	/	/	14.86	3.33
12JS180TA		/	12.10	9.41	7.31	5.71	4.46	3.48	2.71	2.11	1.64	1.28	1.00	0.78	/	/	/	/	11.56	2.59
12JS200T		/	15.53	12.08	9.39	7.33	5.73	4.46	3.48	2.71	2.10	1.64	1.28	1.00	/	/	/	/	14.86	3.33
12JS200TA		/	12.10	9.41	7.31	5.71	4.46	3.48	2.71	2.11	1.64	1.28	1.00	0.78	/	/	/	/	11.56	2.59
12JS240T		/	15.53	12.08	9.39	7.33	5.73	4.46	3.48	2.71	2.10	1.64	1.28	1.00	/	/	/	/	14.86	3.33
12JS240TA		/	12.10	9.41	7.31	5.71	4.46	3.48	2.71	2.11	1.64	1.28	1.00	0.78	/	/	/	/	11.56	2.59
8JS100T-B		/	10.31	7.33	5.09	3.77	2.73	1.94	1.35	1.00	/	/	/	/	/	/	/	/	10.26	/
8JS100TA-B		/	8.12	5.77	3.77	2.98	2.15	1.53	1.00	0.79	/	/	/	/	/	/	/	/	8.08	/
8JS118T-B		/	10.31	7.33	5.09	3.77	2.73	1.94	1.35	1.00	/	/	/	/	/	/	/	/	10.26	/
8JS118TA-B		/	8.12	5.77	3.77	2.98	2.15	1.53	1.00	0.79	/	/	/	/	/	/	/	/	8.08	/
8JS118TB-B		/	11.40	7.94	5.63	4.06	2.81	1.96	1.39	1.00	/	/	/	/	/	/	/	/	11.35	/
8JS118TC-B		/	9.32	6.09	4.06	3.10	2.30	1.50	1.00	0.76	/	/	/	/	/	/	/	/	9.28	/
8JS130T-B		/	10.31	7.33	5.09	3.77	2.73	1.94	1.35	1.00	/	/	/	/	/	/	/	/	10.26	/
8JS130TA-B		/	8.12	5.77	3.77	2.98	2.15	1.53	1.00	0.79	/	/	/	/	/	/	/	/	8.08	/
8JS180T-B		/	10.31	7.33	5.09	3.77	2.73	1.94	1.35	1.00	/	/	/	/	/	/	/	/	10.26	/
8JS180TA-B		/	8.12	5.77	3.77	2.98	2.15	1.53	1.00	0.79	/	/	/	/	/	/	/	/	8.08	/
9JS119T-B		12.11	8.08	5.96	4.42	3.36	2.41	1.77	1.32	1.00	/	/	/	/	/	/	/	/	12.66	/
9JS119TA		11.02	6.55	4.64	3.36	2.46	1.95	1.38	1.00	0.73	/	/	/	/	/	/	/	/	11.52	/
9JS135T-B		12.11	8.08	5.96	4.42	3.36	2.41	1.77	1.32	1.00	/	/	/	/	/	/	/	/	12.66	/
9JS135TA		11.02	6.55	4.64	3.36	2.46	1.95	1.38	1.00	0.73	/	/	/	/	/	/	/	/	11.52	/
9JS150T-B		12.65	8.38	6.22	4.57	3.40	2.46	1.83	1.34	1.00	/	/	/	/	/	/	/	/	13.22	/
9JS150TA-B		12.57	7.47	5.28	3.82	2.79	1.95	1.38	1.00	0.73	/	/	/	/	/	/	/	/	13.14	/
9JS165T		12.65	8.38	6.22	4.57	3.40	2.46	1.83	1.34	1.00	/	/	/	/	/	/	/	/	13.22	/
9JS200T		14.05	8.38	6.22	4.57	3.40	2.46	1.83	1.34	1.00	/	/	/	/	/	/	/	/	14.05	/
9JS200TA		13.96	7.47	5.28	3.82	2.79	1.95	1.38	1.00	0.73	/	/	/	/	/	/	/	/	13.96	/
9JS200TC		10.98	6.55	4.81	3.50	2.56	1.87	1.38	1.00	0.73	/	/	/	/	/	/	/	/	11.50	/

1.3 Numbering of Twin countershaft transmission, all synchronized



1.4 Power transfer path of 12 speeds transmission

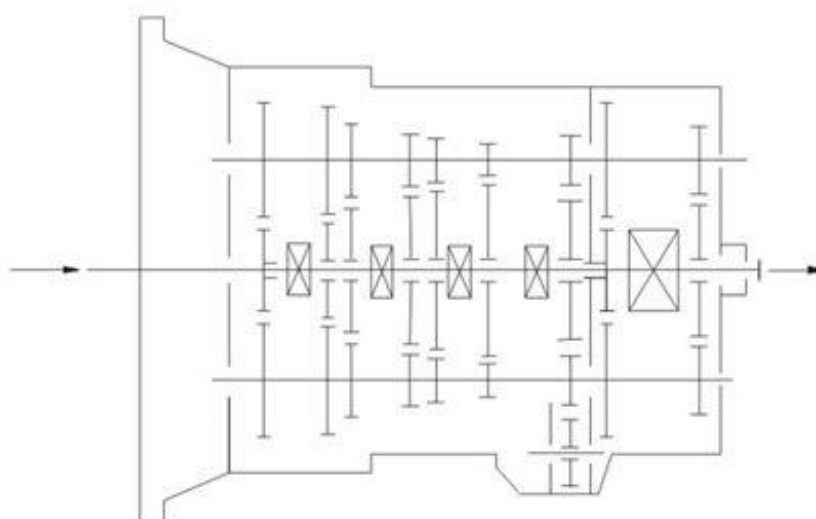


Figure 2 illustration of structure

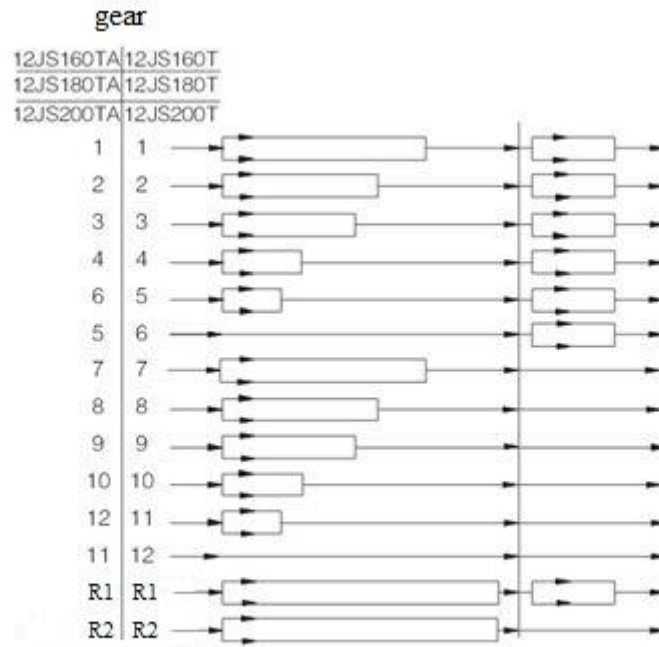


Figure 3 illustration of power path

2 Typical structure of twin-countershaft transmission, all synchronized

The Main and Aux Case are all adopt two countershafts with same structure, alternate with 180° , the power is input from input shaft, and then it can be distributed to the two countershafts, finally influx to the Main shaft for output, so is the Aux Case.

As theoretically each countershaft can only transfer $1/2$ torque, so using the twin-countershaft can reduce the center distance of transmission, the width of gears is less, axial size is shorter and weight is lighter. After using two countershafts, each speed gears on Main shaft must be mesh with two gears on counter-shafts at the same time.

For meeting the correct meshing and distributing the load evenly, the gears of main shaft are in floating status on Main Shaft. The Main shaft adopts the floating structure with hinge joint. The front-neck of Main Shaft insert into the hole of Input Shaft, the guide sleeve with oil is pressed into hole, there is enough radial clearance between the neck of Main Shaft and Guide Sleeve. The back end of Main Shaft insert into inner hole of Drive Gear in Aux Case by involute spline, the shaft neck of Drive Gear in Aux. Case is supported on hole of the ball bearing.

Owing to each speed Gears of Main Shaft are in floating state on Main Shaft, thus traditional roller-bearing is canceled, which make the mainshaft's structure simple. When it works, force by two Countershaft Gears against to Main Shaft Gears are equal in intensity and opposite in direction, therefore they will counteract each other, at this moment the main shaft is only bearing the torque, but not bearing flexural torque, so the stress condition on main shaft and bearing is improved, and the reliability and durability of Transmission are improved greatly.

2.1 Shifting structure

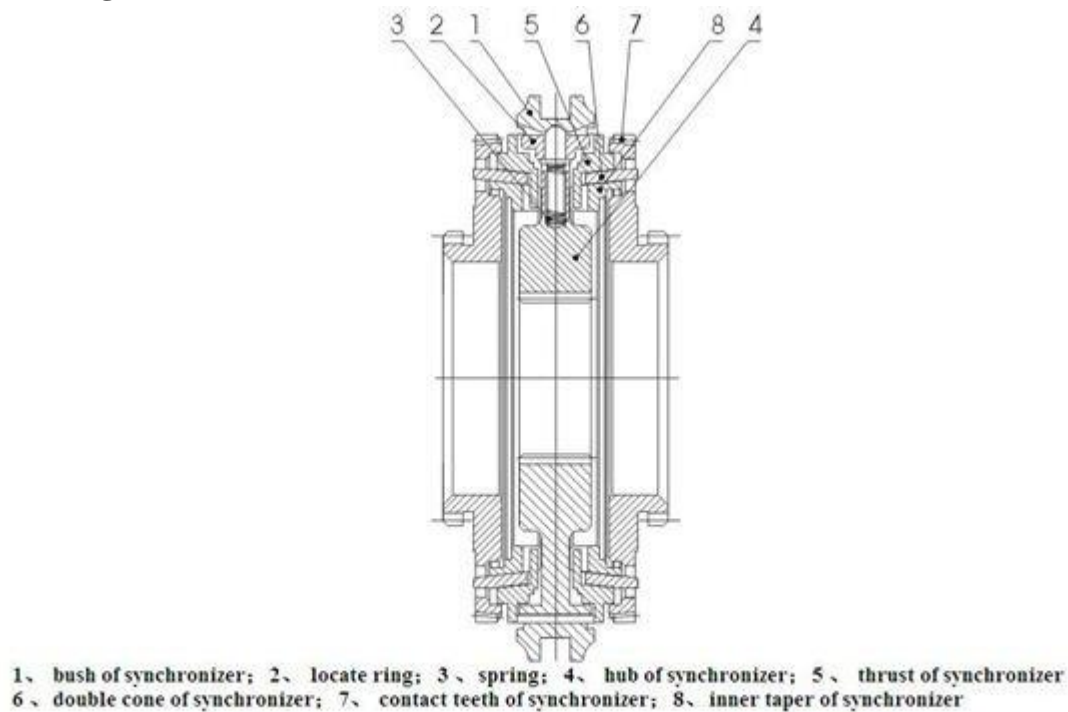


Figure 4 twin-cone faces synchronizer assembly of main case

The synchronizer in transmission make shifting easier and more convenient, low collision and noise, so the gears' life is prolonged, performance can be enhanced, so except the reverse speed gear, other gears are equipped with synchronizers. Inertia synchronizer ensures that it can shift to gears stably and smoothly. It consists of two kinds, inertia locking-stop style and inertia force style. The most prevailing is locking-stop style.

The lock-ring synchronizer has compact structure、 good performance、 high reliability and low cost, so it is widely used currently. The only shortage is that its friction torque is a little lower. The twin cone lock-ring synchronizer is a newly designed synchronizer device, based on similar working theory and structure of the lock-ring synchronizer. It inherits the advantages of the lock-ring synchronizer, and makes up the shortage by improving the friction torque.

Figure 4 is 5-6 speed synchronizer, 5th speed and 6th speed are all cone faces. 5th speed and 6th speed share the synchronizer gear spacer hub、 sliding block and spring. Both of 5th and 6th have three cone parts (5、 6、 8), and six single splines on outside cone (5) of synchronizer combines six spline grooves on the inside cone (8) of the synchronizer, so both the outside cone (5) and inside cone (8) rotate with the main shaft. But six protrudings of cone (6) combine 6 holes of the conjoint ring (7), so the cone (6) rotate with 5th speed gear. As a result, when the transmission is shifting from 4th speed to 5th speed or shifting from 6th speed to 5th speed, a relative speed difference will be produced between the 5th speed gear and the mainshaft, at this time two sliding friction cones of the 5th speed synchronizer cone mechanism will start work. There under the same condition, the friction torque made by the axial thrust of the synchronizer gear spacer equals to sum of the friction torque of the two cones, that is friction torque made while shifting the 5th speed is approximately 2 times that of the single cone, so reducing the shifting force for about 50%.

Working process:

When shifting, meshing bush is taking sliding block and pushing outer cone move forward, because there is aperture after installing synchronizer, cone pushes gear ring and make it close to gear. The friction moment produced by speed difference make out cone rotate a certain angle and fixed by sliding block. At this time, the gear sleeve moves, interface of gear sleeve contacts with that of out cone's outer spline. The shifting force further pushes outer cone through lock-stop slant face, friction happens, consequently the synchronizing forward shifting can be stopped. When the friction moment counteracts with inertia moment of the part being combined, speed difference and friction moment disappear. Ring moment force the outer cone back to position, the lock-stop slant face disengaged, meshing sleeve meshes with synchronizing gear, ensuring a smooth shifting.

Shifting process:

The vehicle driving, each part of transmission position as figure 3 after the driver remove speeds. At this moment, the power from Motor and Clutch transferred to the Input Shaft, through involute spline transfer to Input Shaft Gear, the Input Shaft Gear and Countershaft Drive Gear are meshed each other. The power transferred to the Countershaft, owing to each speed gears on Countershaft and countershaft connecting together, so rotate together. Each speed gears on Countershaft makes each speed gears on Main Shaft rotate together. Because Sliding Clutch of each synchronizer in neutral position, so each speed gears on Main Shaft racing, the Main Shaft no power output.

When the driver operate shifting lever for hangs 5th Speed in cab. Through drive Mechanism of shifting lever, the Yoke Bar (5th & 6th speed) makes Yoke (5th & 6th speed) move to right, the foot of Yoke push Sliding Clutch move to axial direction, now two sliding friction cones of the 5th speed synchronizer cone mechanism will start work. When the relative angular velocity of 5th gear and main shaft is zero, inner spline of synchronizer will mesh the outer spline of 5th gear slightly. So far, entirely hang speed have completed. After the power from Motor and Clutch transferred to Input Shaft , through the spline transferred to Input Shaft Gear, and transferred to symmetrical two Countershaft Drive Gears , and through symmetrical two Countershaft Gears (5th Speed) transferred to synchronizer sliding、 Main Shaft through Spline meshed, and then the power through Drive Gear of Aux Case input Aux Case, Finally the output flange of Transmission output the power through Aux Case.

U Analysis of inertia synchronizer's defects

Lock-ring synchronizer: single cone-face synchronizer, multi-face synchronizer

1) inactive at a early stage: Under usual condition, within warranty period, allowance of synchronizer disappear, make lock and synchronizing effect of synchronizer inactive, it maybe caused by the following factors:

① The disengagement of synchronizer is not thorough enough, so when shifting the synchronizer need to bear more torque, there is a constant friction on the synchronizing cone face, making it inactive.

② The gear ring's cone face of synchronizer does not have a good lubrication, when there is not enough lubrication on the cone face, threads on it will soon wear out, and cause high temperature, making it inactive.

③ Lubrication oil within the transmission is not pure enough, the oil is too dirty, the impurity

material will impair the gear ring's threads, that will affect synchronizer's performance and life, making it inactive.

④ There is machining defects on the synchronizer's cone face, such as cone face's roundness, linearity, and run out, all of this will cause severe friction on the cone face, making it inactive.

2) The synchronizer's teeth get broken and fractured, it is caused by design and machining problem, such as too small filleting, too thin thickness of shell, cracks and so on.

3) Inner cone face gets broken. We should think if the space is suitable for installing synchronizer, if the space is too big it will impair the performance and durability, if the space is too small, the cone face will have a bad lubrication or completely get broken.

2.2 Controlling structure

The basic mechanism of 12 speeds series is twin H remote operation, with impact structure, clear speed position and good handle. R1、2、3、4、5、6 are at the low-speed section, and R2、7、8、9、10、11、12 are at high-speed position. The neutral of low-speed section is at 3, 4 speeds, the neutral of high-speed section is at 9,10 speeds.

(See figure 5)

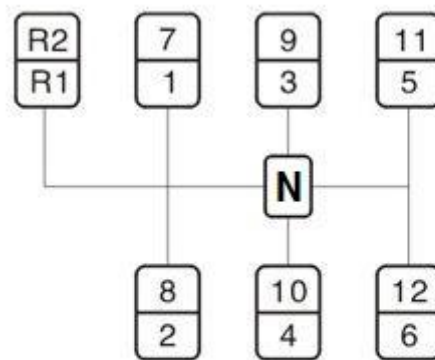


Figure 5 illustration of control hand

See figure 6, the operation mechanism is made up of operation mechanism housing、outer shifting arm、horizontal shifting level、reverse switch control block、shifting bar、compressed spring、air plug、indicator switch、starting pin、and so on. It is use for choosing a speed、hanging a speed and disengage a speed. Each side of the shifting bar has a fan-shaped convexity, and grooves on the convexity control neutral indicator switch and air-path control valve. The reverse indicator switch is controlled by moving and rotating the reverse switch control block.

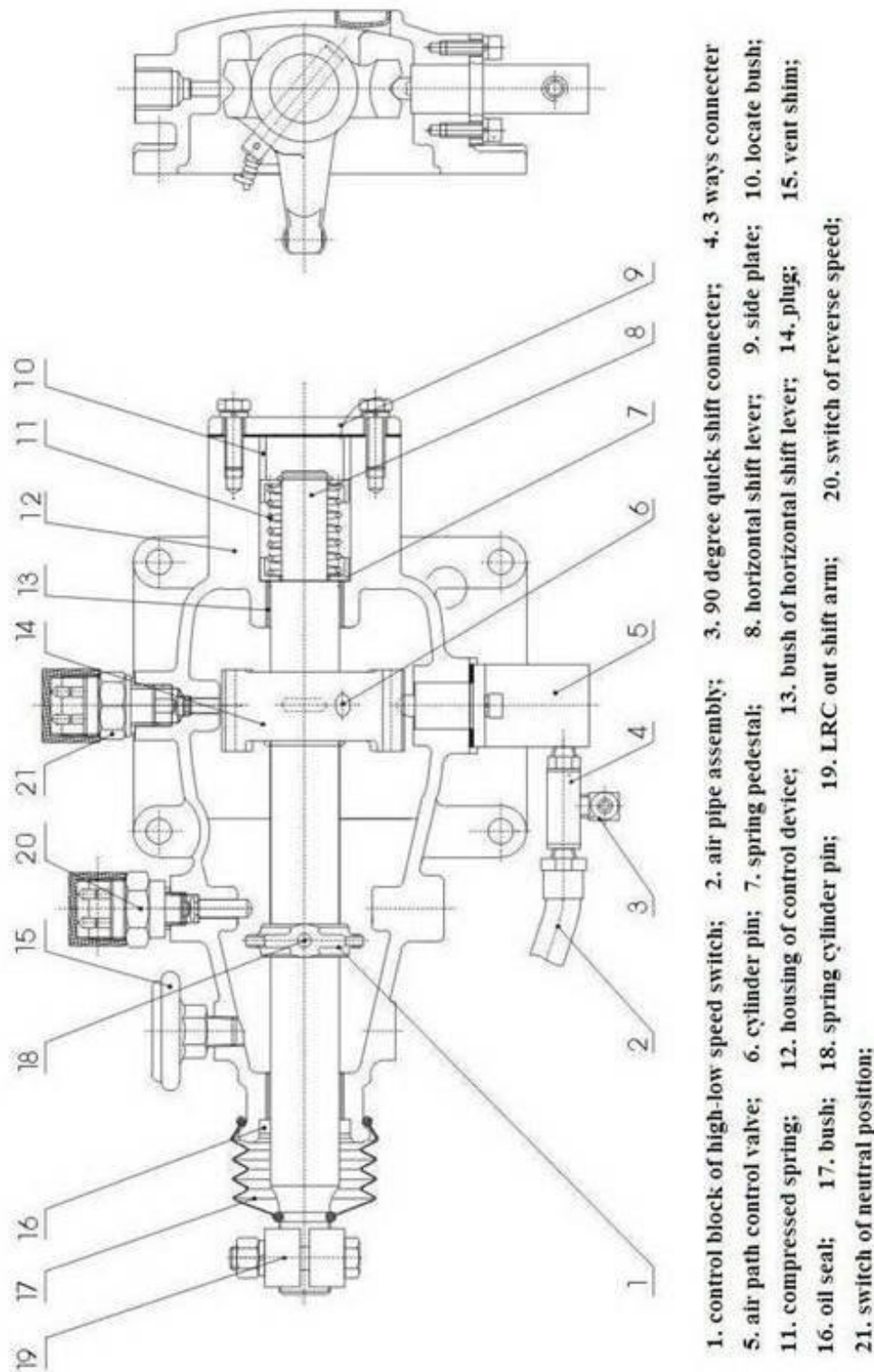


Figure 6 illustration of single H device

2.3 Working theory and pneumatic path of 12 speeds transmission

The compressed air from the vehicle, will be decreased from 0.7-0.8Mpa to 0.57-0.6Mpa by the air filtrating regulator, then enter main pipe and air entering control pipe. When the main case is at the neutral position, air-path stopping valve opens, the compressed air enters into the air-path commuting valve. The

compressed air enters into cylinder vent plug through low-speed pipe, the cylinder's piston moves synchronizing bush of auxiliary case to mesh with reduction gear, at this time, transmission is at all low-speed, as R1,1,2,3,4,5,6 speeds; select High at the preselector, there is no air in the outgoing pipe, the compressed air comes into high-speed pipe and then to cylinder's high-speed incoming vent plug, the cylinder's piston moves synchronizing bush of auxiliary case to mesh with drive gear of auxiliary case, at this time, the transmission is at all high-speed, as R2,7,8,9,10,11,12. Neutral position of low speed is 3,4 speed. Neutral position of high speed is 9,10 speed.

Figure 7 illustration of air path about single H

- 1) The air control valve only opens when it's in neutral position, when shifting, the air path will be blockaded at the valve. That is, only when transmission is in neutral position, can shifting speeds be realized.
- 2) When low speed, there is air at outgoing vent of the pre selector; when high speed, there is no air at outgoing vent of the pre selector.

In order to meet certain demands of special vehicles, at rear and down part of 12JS180T transmission, between clutch housing and transmission, PTO can be installed. Power taking-off from the lengthened Countershaft of the Aux case, it is called rear PTO. It's most prevailing nowadays. If it's installed between clutch housing and transmission it's called front PTO or all-power PTO.

Hole A and Hole B are connected separately with low-speed air-inlet and high-speed air-inlet corresponding to the twin H air valve, with air-pressure of 0.57-0.6 Mpa. Hole C is compressed air inlet with air-pressure of 0.7-0.8 Mpa. First put the Transmission operating rocker at neutral position of low-speed section, here the piston (15) will press closely the position ring, then operate the cylinder-control vale to let compressed air enter the neutral position cylinder (9) via Hole C. Owing to pressure difference, the neutral position cylinder (11,13) will move left till the position ring, here, the range speed piston (15) will be in neutral position. When you shift to a proper speeds, connect with air path of PTO, engage the clutch, the static power taking off can be realized.

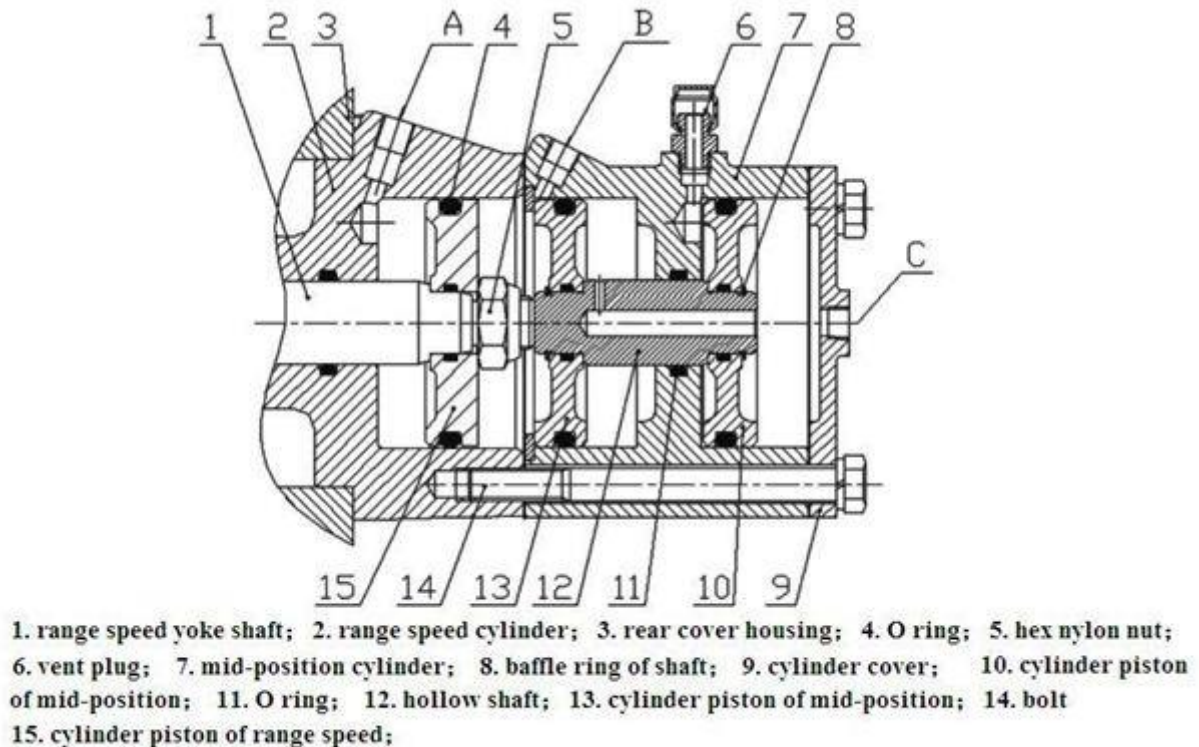


Figure 8 structure of cylinder at neutral position

If mid-position cylinder was adopted instead of pressure-adding cylinder, the transmission and vehicle's air pressure difference is very small, the static power taking off would be hard to realize, in that case, we can change controlling method to achieve that goal.

- 1) Switch the transmission handle to high position, the transmission is shifting to high speeds.
- 2) Connect the pneumatic path of the PTO, let air come into the inlet plug of mid-position cylinder. Push mid-position cylinder's piston until it reaches the locating ring.
- 3) Switch the pre-selector handle to low speed position, due to the air pressure the piston of shifting cylinder can not return to low speed position, only staying in mid-position.
- 4) Shift, the vehicle stops, then power take off.

3、 Maintenance the twin-countershaft transmission, all synchronized

3.1 Use and maintenance transmissions

It is very important to correctly use and periodically maintenance the transmission, so that the vehicle can safely move and the life of transmission can be prolonged.

3.1.1 Brand of the gear oil

Transmission should be filled with GL-5 (85W/90) vehicle gear oil.

3.1.2 Correct oil level

Ensure the oil level is even with the oil-filling orifice. The oil level should be inspected by conic filling-hole on the side of case. Fill the oil till it overflows at the orifice. (refer to content 1.1)

3.1.3 Working Temperature

The lubrication oil temperature can not be above 120°C or bellow -40°C in a continuous work period. If the temperature is above 120°C, the lubrication will decompose and life of the transmission will be shortened, if the temperature is below -40 °C, the oil seals will be damaged.

3.1.4 Oil changing cycle

New Transmission should change lubricating oil after running 2000-5000 Km.

Check lubricating oil level and leaking after 10000 Km, make up at any time.

Change lubricating oil each 50,000Km. When working in heavy burden, in severe condition or steep slope, the changing cycle should be shortened.

3.1.5 Towing and sliding

When the transmission is the working, continuous rotation of gears and shafts can provide enough lubricating oil for transmission. When the rear wheels of the vehicle is being towed, countershaft gears and main shaft gears of the main case don't rotate, but the main shaft driven by the rear wheels rotate at high speed, the adjusting gaskets driven by mainshaft also rotate at high speed, which will destroy the transmission badly due to speed difference and lack of lubricating oil

! Warnings:

When the engine is going out, neutral sliding will also cause the same evil consequence.

If the vehicle needs towing, you can draw out the half shaft or off the drive shaft, or tow with the drive shaft part from the earth. So any towing without preventive measures are prohibited.

3.2 Pay attention to those points

3.2.1 Before vehicle' starting, brake should be released. If your automobile adopts the pneumatic brake, only after turn on brake valve and wait until air pressure goes up to required pressure, you can hang shift for starting.

3.2.2 Adopt 3rd speed or 4th speed to start, according to highway condition.

3.2.3 Shifting level have neutral at both high-speed section and low-speed section, that is at 9th –10th neutral position at high-speed section and 3rd – 4th neutral position at low-speed section. When stopping the vehicle, transmission should be set at low-speed position, and the conversion switch on the operation arm is at the low position.

3.2.4 Before shifting, clutch should be release entirely, or it will impair life of transmission.

3.2.5 When hanging a reverse, first do stop the vehicle, then hang, so as to prevent breaking the spare parts inside the transmission. When hanging a reverse, use bigger force to choose the speed to overcome the resistance of the reverse lock.

3.2.6 When shifting from 6th to 7th (or from 7th to 6th), halt for a movement consciously to insure the Aux. Case accomplish the conversion from low speed to high speed (or from high speed to low speed). Before removing a speed, move the operation arm to the aimed position at first, then process conversion of high and low speed.

3.2.7 Forbidden to change from high to low (or from low to high), don't skip speed, otherwise life of synchronizer in Aux case will be shortened.

3.2.8 Regularity Check vent-plug, if blocked with dirt, should be cleaning at any moment.

3.2.9 Should be check filter-web of air filtrating regulator each running 20,000 Km, cleaning filter-web and wall of filtrating regulator with subs, and make it dry with compressed air.

3.2.10 Try to avoid changing from high to low (or from low to high), when vehicle downhill

3.2.11 If there is abnormal noise, you fell heavy in operation, stop and check immediately

3.2.12 Operating the PTO must strictly accord the operation criterion, otherwise may destroy the synchronizer Aux. Case.

3.2.13 Don't dismantle or assembly a transmission by yourself during the "three guarantee" period.

4、Assemble and disassemble twin-countershaft transmission, all synchronized

(Take 12JS200T transmission as example)

4.1 assemble and disassemble shifting mechanism (single H valve)

1. single left control transmission of 12 speeds



2. detach the inner hex bolt of air-pipe from sing-H assembly



3. detach supporting bolt from air-pipe commutating valve at right side of shift bar



4. detach the 4 locating bolts of single H assembly



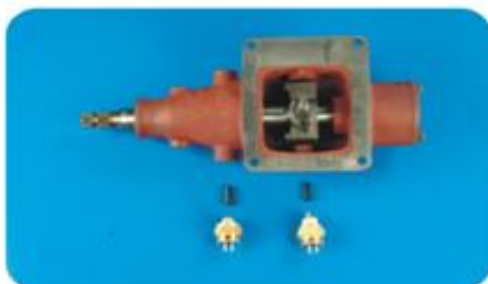
5. knock and dismantle the single H assembly



6. detach shifting rocker, dust proof, breather plug



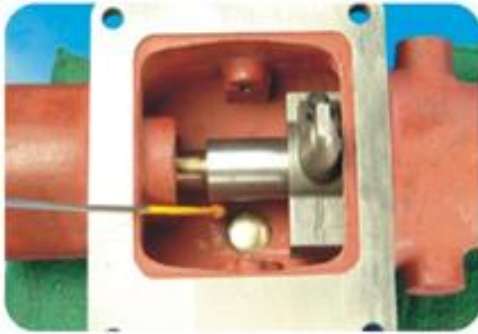
7. detach the switch and pin of low, reverse speeds



8. detach 2 bolts off the side plate, take out spacing valve, then take out circlip pliers off horizontal shifting shaft



9. turn double H housing, take out bowl-shape shim and wires



10. Take out the cylinder pin off the shifting block



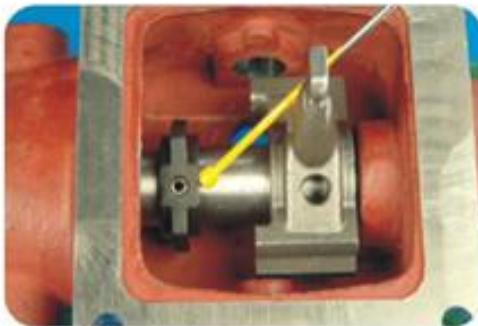
11. Take out spring cylinder pin off reverse control block, showing horizontal shifting shaft



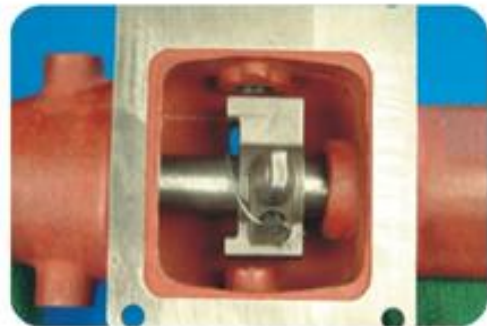
12. assemble, if the oil seal already detached, fit it into the single H valve



13. install horizontal shifting shaft, then spring cylinder pin to reverse control block



14. fit cylinder pin into shifting block, and fix with steel wires



15. assemble spring, spring pedestal, and circlip



16. fit into spacing sleeve, install side plate



17. install starter pin and switches for reverse and neutral position

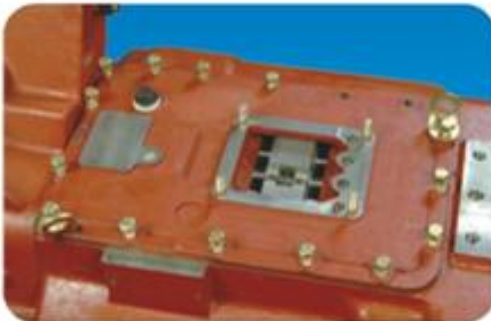


18. install dust proof and shifting yoke, make sure the yoke and block are in line



4.2 Assemble and disassemble shift bar

1. Detach bolts from shift bar



2. Detach the four bi-head bolts from shifting bar housing with tools



3. Knock shift bar with bronze stick, detach it from gasket.
Note: use hand to ward the spring holes, preventing spring from dropping into holes



4. Take off the shift bar, take out the springs and steel balls



5. Turn the shift bar, detach the reverse yoke, yoke shaft and guide block



6. Detach spring cylinder pin off the 1/2 speed yoke, take off yoke and shaft, inter-lock pin and steel ball



7, Detach spring cylinder pin off 3/4 speed yoke, take off yoke and shaft, inter-lock pin and steel ball



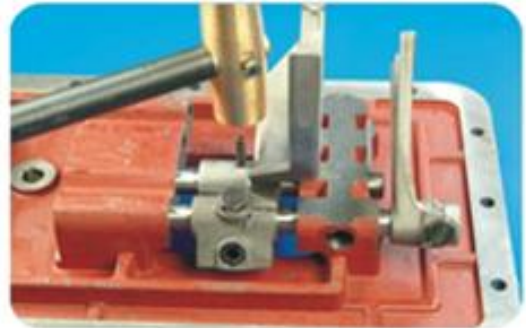
8, Detach locate bolts off 5/6 speed yoke shaft, take off yoke shaft, 5/6 speed yoke and guide block.



9, Mount low-reverse speed guide block and yoke onto yoke shaft, fix it with taper bolts, fasten wires and fit into a inter-lock steel ball



10, Install 1/2 speed yoke shaft, fit into spring cylinder pin, note: interlock-pin of 1/2 speed yoke shaft should not be missed.



11, Fit into one inter-lock steel ball



12, Install 3/4 speeds yoke shaft, install spring cylinder pin on yoke and interlocking pin and interlocking ball



13. Install 5/6 speeds yoke shaft, then install 5/6 speed guide block and yoke, fasten the wires with bolts



14. Install the shift bar onto main case



15. Install 4 bi-head bolts onto shift bar, fit locating spring and steel ball.

Note: 5/6 speeds yoke shaft has a wide inner spring.

4.3 Assemble and disassemble assembly of auxiliary case

4.3.1 Disassemble assembly of auxiliary case

1. Make the two synchronizers in main case mesh with gear respectively



2. Screw flange nut of output shaft with special wrench



3. Take off 3 pipes from auxiliary cylinder and take off 2 bolts from air filtration



4. Take off the connecting bolts between rear housing and main case



5. Screw out the 3 bolts of auxiliary case for about 10 mm



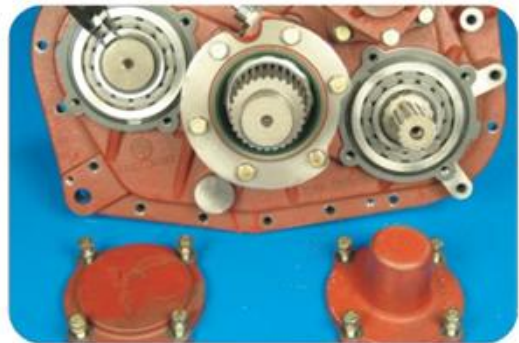
6. Take off auxiliary case with tools



7. Take off flange nut and flange panel



8. Take off 2 output bearing cover, get down the clasp from auxiliary shaft with tools



9. Knock the output shaft rearward, depart it from bearing, take down bearing of countershaft



10. Two countershafts and bearings



11. Take off the bolt which connects shifting cylinder of auxiliary case and shifting yoke of auxiliary case



12. Take off the 4 bolts of auxiliary shifting cylinder, get down the cylinder assembly.



13. Take off synchronizer from output shaft



14. Knock the output shaft rearward to make it fall from the bearing hole



15. Brace the output shaft assembly, knock down the bearing



16. The components of output shaft assembly



17. Take off the bolts of bearing cover of output shaft, get down the bearing cover, disassemble connector of odometer, drive gear and driven gear.



18. Take out the outer ring of bearing from the rear cover housing



4.3.2 Disassemble shifting cylinder of auxiliary case

1. shifting cylinder of auxiliary case



2. Screw down the bolts of cylinder housing and take out steel ball, spring.



3. Take off the interlocking nut of cylinder piston, get down sealing ring from piston



4. Piston of shifting cylinder and sealing ring



4.3.3 Assemble and disassemble synchronizer of auxiliary case

1. High, low speeds cone ring, 3 springs and sliding bush



2. Put low speed ring of synchronizer on desk, with the pin side upward, fit into sliding bush



3. Add high speed ring, rotating to make it to proper position

4.3.3 Assemble the auxiliary case

1. Put the synchronizer low speed ring on a wooden block (50mm), insert input shaft



2. Fit into gasket ring of main shaft of auxiliary case, with the groove side downward



3. Put reduction gear onto output shaft, with the flat side upward, then put gear press plate of auxiliary case.
Note: Lubricant oil should be basted on the gear pressing plate.



4. Install the compounding bearing onto output shaft, mark on the reduction gear of auxiliary case.



5. If the inner bearing ring of countershaft is disassembled, install it on.



6. Mark the countershaft, which should be consistent with the mark on the gear.



7. Mesh the two countershafts with the reduction gear, marked teeth should be against each other.



8. Install onto ear case housing, note: the lengthened countershaft (for PTO) should be installed at the right-down part of the rear housing



9. Install the 3 bearings onto rear housing.



10. Install the clamp ring onto the countershaft bearing



11. Install the 2 countershaft covers



12. Install out put shaft cover, install odometer passive and active gear and connector



13. Insert shifting yoke into sliding bush of synchronizer, mount bolt to connect yoke and cylinder, fix them with steel wire.



14. Mount shifting cylinder of auxiliary case



15. Fasten flange nut with special tools.



16. Put synchronizer of auxiliary case at low-speed position



17. Baste oil evenly onto the 2 bearing holes at the rear part of main case. (it's important)



18. Assemble auxiliary case with special crane



19. Fix the bolts which connect the rear cover and main case housing.

4.4 Assemble and disassemble assembly of main case

4.4.1 Disassemble input shaft (this method can be used to change input shaft without disassembling the main case)

1. Demount the bolts on the clutch housing, take down the clutch housing



2. Demount the bolts on input shaft cover, slightly knock to take out the input cover.



3. Mesh the synchronizer with two groups of gears.



4. Demount the pressing plate at the front end of countershaft of main case, then demount the nut of input shaft.



5. Knock input shaft inward



6. Knock the input shaft right and left to make it fall out from the hole of housing.



7. Take off the gasket of input shaft gears.



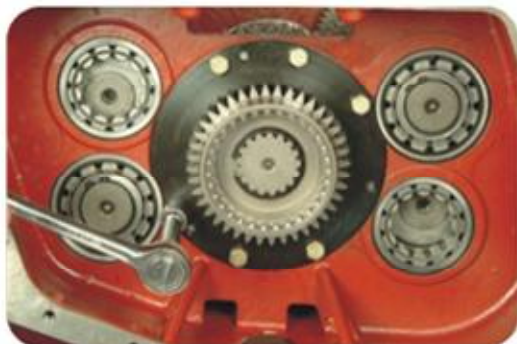
8. Take out the clamp circle of input shaft gear.



9. Use the pressing plate and one bolt (M10x1) to press input shaft, to avoid impairing the 5/6 synchronizer when assemble and disassemble. The pressing plate can be customized according to actual situation.

4.4.2 Disassemble the driving gear assembly

1. Cut off the steel wires of drive gear assembly, demount the 6 bolts.



2. Take out the clamp circle on the inner hole of drive gear, take off the drive gear and locating plate.



3. Knock the bearing pedestal to take off drive gear and bearing.



4.4.3 Disassemble reverse idler gear assembly

1. Disassemble the clamp in the reverse gear of main shaft.



2. Disassemble the gear gasket of main shaft in the reverse gear.



3. Demount the bearing at the end of idler gear shaft with special tools.



4. Screw out the bolt in reverse idler gear shaft.



5. Loosen interlocking nut on the shaft of reverse idler gear.



6. Use a pulling tool to extract the shaft of reverse idler gear

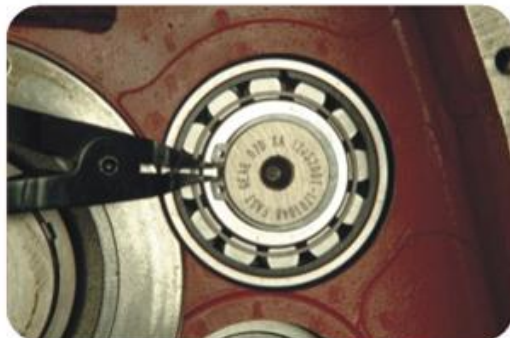


7. All the components of idler gear assembly

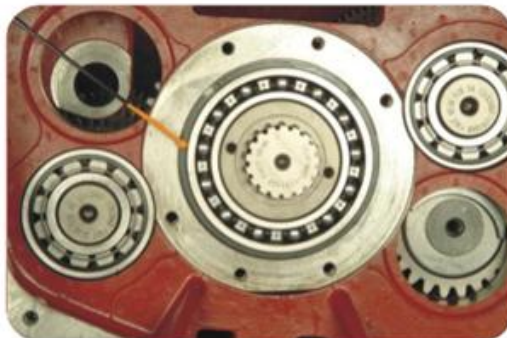


4.4.4 Disassemble main case assembly

1. Demount the clamp at the rear part of countershaft in main case.



2. Mount drive gear bearing, set fix the rear part of main shaft



3. Demount the rear bearings of two countershafts.



4. Knock the countershaft with bronze stick to make it move backward for about 10 mm, demount 2 front bearings with special tools.



5. Again demount the drive gear bearing.



6. Take main shaft assembly out from the main case.



7. Take out two countershafts assemblies and disassemble reverse idler gear.



4.4.5 Assemble and disassemble main shaft assembly

(It's not necessary to adjust the gears' backlash to avoid adjustment referring to 12 speeds transmissions)

1. Disassemble the baffle plate at front part of main shaft, take off gear of input shaft and 5/6 speed synchronizer compounding.
2. Demount the clamp which is used to fix 5/6 synchronizer, dismantle 5/6 synchronizer.



3. Take out the spring pin of main shaft, extract long key, dismantle gears and gaskets of main shaft.



4. Assemble. Put main shaft on desktop, with the small end upward, fit gasket of reverse gear, rotate for one tooth distance, then insert long key.



5. Assemble the reverse sliding bush of main shaft, the etch should aim at the groove of main shaft with a hole, short teeth side upward.



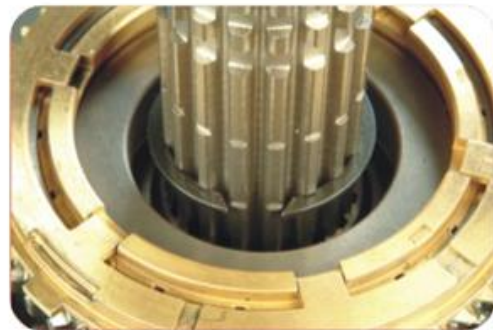
6. Assemble gasket of gear of main shaft, rotate for one tooth-distance and insert a long key.



7. Fit input gear into main shaft, mount spline gasket, with the flange side upward, rotate for one tooth-distance then insert a long key.



8. Put 1/2 speed synchronizer compounding, fit a clamp, the aperture should be aiming at the groove of main shaft with a hole on it



9. Mount gear hub of 1/2 speed synchronizer, then mount a clamp, the aperture aiming at the groove of main shaft with a hole on it.



10. Mount another compounding of 1/2 speed synchronizer, then mount main shaft spline, with the flange side downward, rotate for one tooth-distance, insert a long key.



11. Mount 2nd speed gear onto main shaft, mount gasket, rotate for one tooth-distance, insert a long key.



12. Mount 3rd speed gear onto main shaft, mount spline (with flange side upward), rotate for one tooth-distance, insert a long key.



13. Put into one compounding of 3/4 speed synchronizer, mount a clamp, the aperture aiming at the groove of main shaft with a hole on it.



14. Mount gear hub of 3/4 speed synchronizer, then mount a clamp, the aperture aiming at the groove of main shaft with a hole on it.



15. Mount another compounding of 3/4 speed synchronizer, then mount main shaft spline, with the flange side downward, rotate for one tooth-distance, insert a long key.



16. Mount 4th speed gear onto main shaft, mount gasket, rotate for one tooth-distance, insert a long key.



17. Mount 5th speed gear onto main shaft, mount spline (with flange side upward), rotate for one tooth-distance, insert a long key.



18. Put into one compounding of 5/6 speed synchronizer, mount a clamp, the aperture aiming at the groove of main shaft with a hole on it.



19. Mount spring pin of main shaft, put the long key to a proper position.



20. Mount gear hub of 5/6 speed synchronizer, then mount a clamp, the aperture averting the groove of main shaft with a hole on it.



21. Put into another compounding of 5/6 speed synchronizer, mount input shaft gear.



22. Use pressing plate to fix input gear onto main shaft.



4.4.6 Assemble main case assembly

1. Assemble reversing idler gear, with the flange side forward.



2. Assemble shaft of reverse idler gear, screw interlock nut



3. Mark on teeth against groove of countershafts



4. Put the 2 countershafts in main case.



5. Mark teeth which is 180 degree opposite of input gear, put main shaft in main case, install drive bearing to fix the rear part of main shaft.



6. Mesh marked teeth with marked groove of input gear, mount rear bearing of countershaft.



7. Mount front bearing of countershaft.



8. Use same method to assemble the rear/front bearing of another countershaft.



9. Detach pressing plate in front of input gear, lubricate hole of input shaft, insert input shaft into spline of input gear.



10. Assemble the clamp of input gear



11. Assemble a gasket of input gear.



12. Assemble a bearing of input shaft



13. Baste mucus on nut of input shaft, mount it with special tools



14. Fix the nut of input shaft in the groove.



15. Mount front baffle plates for 2 countershafts, then assemble input shaft cover.



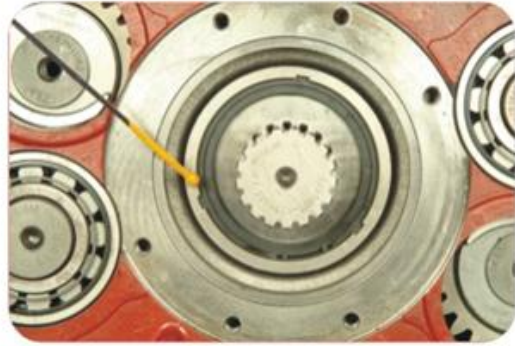
16. Assemble reverse idler gear, detach bearing of drive gear, pull reverse gear of main shaft backward, make it mesh with reverse idler gear.



17. Mount a gasket of main shaft gear into reverse gear.



18. Mount a clamp into inner side of reverse gear of main shaft.



19. Mount the bearing of drive gear, then mount location plate, use steel wire and nut to fix it.



20. Assemble drive gear of auxiliary case, then mount a clamp on rear part.



21. Mount 2 front bearings for lengthened countershafts, then mount clamps at the rear part of countershafts in main case.



22. Assemble the clutch housing assembly.



The 12 speeds transmissions of twin-countershafts with synchronizers can be assembled according to the above instructions. For 16 speeds transmission, above instructions can be used.

5、Typical structure and working theory of 16 speed transmissions

5.1 The typical structure of 16 speed transmissions

5.1.1 Main structure of 16JS200T transmissions

16JS200T transmission is in $2 \times 4 \times 2$ structure. The gears on the input shaft, main shaft and main shaft in auxiliary case are in radial floating condition. Input shaft gears are freely set on the input shaft, using the spline washer and snap ring to fix axial position, which is simple in structure, convenient in assembly, and also gets rid of the adjusting shim; the input shaft differential gear is also freely set on the input shaft; between the input shaft gear and differential gear equipped a single-taper-face lock-ring inertial synchronizer which is pneumatic operation and engaging a speed through yoke of shift bar cylinder. The 1st gear, 2nd gear and reverse gear of countershaft are integrated with the countershaft, other gears on the countershaft match and joint with the countershaft via given magnitude of interference and semicircular key or long key. The main shaft gears is freely set on the main shaft, using the spline washer, snap ring and the long hexagonal key to fix axial position, and there is no need to conduct axial adjusting. On the main shaft there are two sets of double-taper-face lock-ring synchronizers that are large in capacity and flexible in engaging a speed. In the rear auxiliary case, the auxiliary drive gear connects with the main shaft via spline. And the auxiliary countershaft driving gear is welded on the auxiliary countershaft. The auxiliary main shaft reduction gear is supported on the shaft by spline washer, and the gear can radial float. The rear auxiliary case adopts the enhanced lock-pin synchronizer, with non-metal friction material, and high in reliability. Both in the main case and auxiliary case, except reverse gear, 1st gear and rear auxiliary reduction gear, the other gears all use fine teeth design, with big overlap ratio, stable gear engagement and low noise.

In the main case of 16JS200T twin-countershaft transmission, there are two completely same countershafts, in dimensions and structures, so is the auxiliary case.

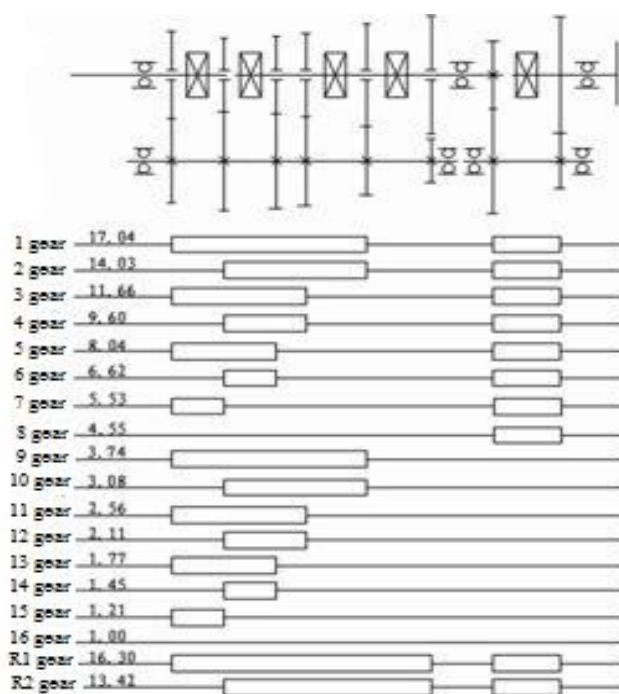


Figure 9 power transfer path of 16 speeds transmission

5.1.2 Power Transfer Path of 16JS200T Transmission

The power transfer path of 16JS200T see figure 9.

The engine power is transferred to the input shaft of transmission through clutch. The synchronizer on the input shaft connecting with the input shaft differential gear or input shaft gear, which realizes the engagement of input shaft gear and countershaft drive gear, then drives the countershaft and its gears to rotate, mean while another gear on the input shaft is rotating with no engagement. Gears on the countershaft constantly mesh with the main shaft gears, consequently gears on the main shaft rotate at the same time. Gears of mains shaft are freely set on the main shaft, so the main shaft doesn't rotate when transmission is at neutral speed (meaning the synchronizer at the middle position). When the synchronizer of main shaft moves to a speed and connects the gear with main shaft, the main shaft will rotate.

When the rear auxiliary case at high-speed region (that is the synchronizer sleeve moves to the front of the transmission), the main shaft output power will be transferred to the auxiliary main shaft through auxiliary drive gear and synchronizer sleeve, then output directly. When the auxiliary case at low-speed region (that is the synchronizer sleeve moves to the back of the transmission), the main shaft output power will be transferred to the auxiliary countershaft through auxiliary drive gear, then via main shaft reduction gear of auxiliary case and synchronizer sleeve, transferred to the auxiliary main shaft, and output.

5.1.3 Structure of synchronizers

You can choose from 3 types of synchronizer to equip with 16 speed transmission. As the figure shows, (a) is a parity synchronizer, It has small rotation difference, so it uses single-taper-face, and friction face 1 adopts carbon fibre material. Because front auxiliary is pneumatic control, the structure of the synchronizer is uni-direction design; (b) is main case synchronizer, which is double-taper-face. There are two sets of this synchronizer, one is between 1st speed and 2nd speed, the other is between 3rd speed and 4th speed.

Because there are two assistant frictions 1 and 2, the synchronizing capacity is greatly improved, and shifting is more flexible. The assistant frictions are with steel-ring and brass material and there is middle position in the synchronizer to meet the demand of neutral speed. The above two kinds of synchronizer are lock-ring inertial synchronizer. (c) is rear auxiliary case synchronizer, which is lock-pin inertial synchronizer. It is pneumatic control, so the structure of the synchronizer is also uni-direction design, and with carbon fibre material. Because the ratio difference is big in the rear auxiliary case (about 4.55), large

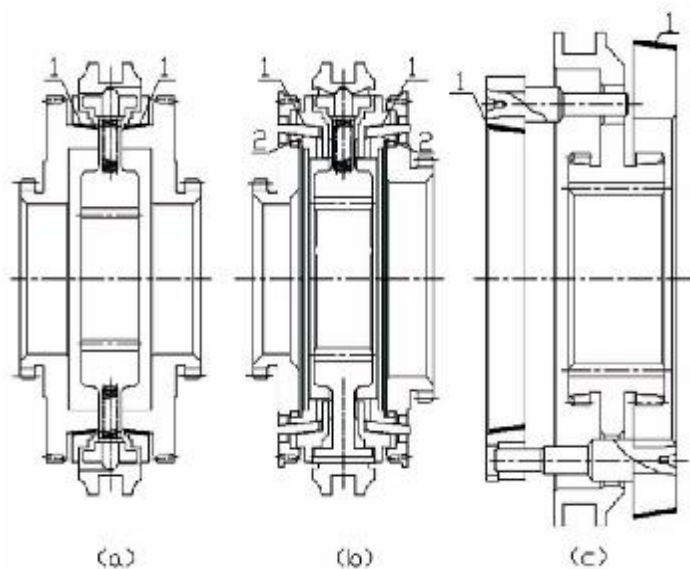


Figure 10. structure of synchronizer

synchronizer capacity is required, and cylinder thrust force is big, then the impact force will be big when engaging a speed. It is testified that lock-pin synchronizer is more resistant to impact force than lock-ring synchronizer, so rear auxiliary case chooses lock-pin synchronizer. This kind of synchronizer switch automatically only when shift between high-speed and low-speed.

5.2 Pneumatic path and working theory of 16 speed transmissions

16 speed transmission is remote control, and it has two kinds of control mechanisms, that are single-lever double-H control and double-lever double-H control. The main transmission adopts manual control, and front auxiliary case uses pneumatic control, see figure 11 as double-H shifting mechanism hand ball position chart and figure 13, as control hand ball chart. When the switch of hand ball pre-selector valve is at position 1, the hand ball can engage 2-4-6-8-10-12-14-16 and R2 speed; when the switch at position 2, the hand ball can engage 1-3-5-7-9-11-13-15 and R1 speed, that is position 1 is even number speed, and position 2 is odd number speed.

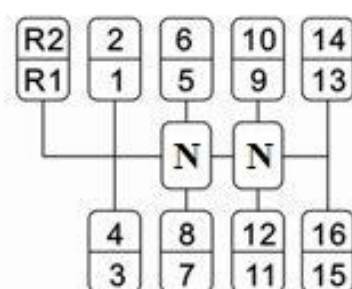


Figure 11 Position of shifting hand ball in double-H mechanism

The auxiliary case of 16JS200T is also pneumatic control, but only shift between high-speed and low-speed is realized automatically in the double-H control mechanism.

16JS200T transmission uses plug-in type structure, so there is whole-speed and half-speed. Usually the transmission runs at odd speeds or even speeds. That is when engaging a speed with the control hand ball, no need to turn the odd and even shift switch, only on the special road conditions(as climbing long slop or hill way, the engine may not at best working condition at some speed, at this time turn the switch can realize whole-speed and half-speed shift.) . In this way, the working strength can be reduced and working life of synchronizer in the front auxiliary case will be prolonged.

The front and rear auxiliary cases of 16JS200T transmission are all pneumatic control, and their air path see figure 12. The compressed air from the vehicle air tank (about 7-8 MPa) is divided into two ways by the transmission air filtrating regulator, one is provided to the front auxiliary case (about 2.8-3.2 Mpa); the other is provided to the rear auxiliary case (about 6.7-7.1 Mpa). Air path of that providing to front auxiliary case: the compressed air from the air filtrating regulator enters into single-H valve 6 through air valve 4 (the getting through or breaking of valve is controlled by clutch pedal. When the clutch is released completely, air path gets through; when the clutch is connecting, air path breaks). The getting through or breaking of single-H valve is controlled by the even and odd shift switch, and result is connecting the whole-speed or half-speed. Air path of that providing to rear auxiliary case: the compressed air from the air filtrating regulator gets through double-H valve (the getting through or breaking of the valve is controlled by the double-H control device), and on the double-H valve hole 1 is air inlet, hole 2 and hole 4 are air outlet, hole 3 and hole 5 are air exhausting. And the result is connecting the high-speed region or low-speed region. The working theory of single-H, double-H and pre-selector valve will be described in detail below.

2) Working theory of single-H valve (also: follow-up valve): see figure 14:

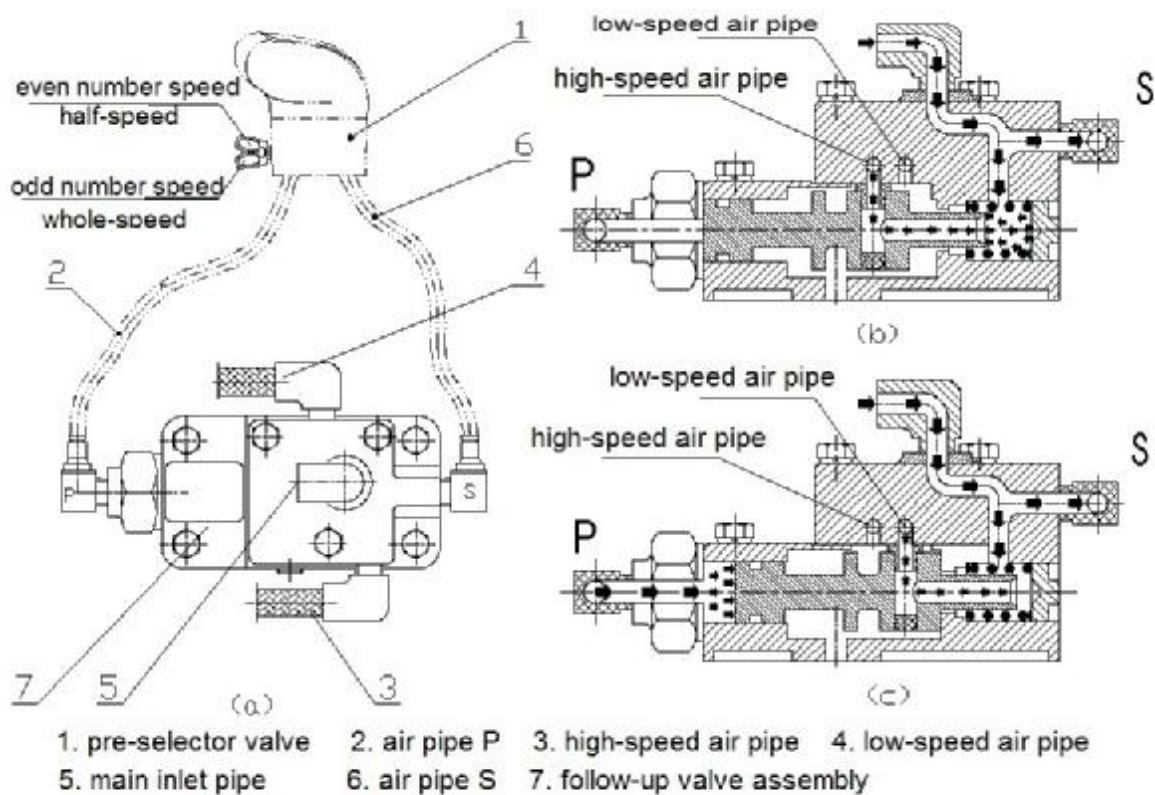


Figure 14 Working theory of single-H valve

When the clutch has been completely released, continue to tread the clutch pedal, the control valve under the clutch pedal will be open, then the compressed air (about 2.8-3.2 Pa) from the transmission air filtrating regulator will enter into main air pipe 5, see figure 14 (a), then from main air pipe 5 enters into follow-up valve assembly 7. If the odd and even shift switch of pre-selector 1 is at even number speed region, air pipe S will get through with air pipe 5 (see figure 14 (b)), and the compressed air will push the piston move to the right so that main air pipe 5 connects with even number speed (that is half-speed) air pipe 3 which is connecting with the shifting cylinder in the front auxiliary case, so the synchronizer in the auxiliary case of the transmission will be at even number speed region position. If the odd and even shift switch of pre-selector 1 is at odd number speed region, air pipe S6 will get through with air pipe P2, see figure 14 (c), and the compressed air will push the piston move to the left so that main air pipe 5 connects with odd number speed (that is half-speed) air pipe 4 which is connecting with the cylinder in the front auxiliary case, so the synchronizer in the auxiliary case of the transmission will be at odd number speed region position.

There are two interfaces on the shifting cylinder in front auxiliary case, which are relatively connecting with odd or even number speed air pipe, so by moving the piston to left or right to control the front auxiliary case be at odd number speed or even number speed (that is at half-speed or whole-speed position).

5.3. Points when assemble and disassemble 16 speed transmissions

5.3.1 Assemble main shaft of 16 speed transmission

1. Put main shaft vertically on working table, mount reverse gasket, rotate for one tooth distance and put the long key through.



2. Mount reverse gear onto main shaft, with meshing teeth upward, mount reverse sliding bush, the aperture aiming at the groove of main shaft with a hole on it



3. Mount gasket onto main shaft, rotate for one tooth distance, push the long key upward.



4. Mount 1st gear onto main shaft with the meshing teeth upward, mount a spline, rotate one tooth then push the long key upward.



5. Mount a compounding of 1/2 speed synchronizer, then mount a clamp.



6. Mount a hub of 1/2 speed synchronizer, then mount a clamp



7. Mount another compounding of 1/2 speed synchronizer, then spring gasket of mainshaft gear, rotate one tooth, push the long key upward.



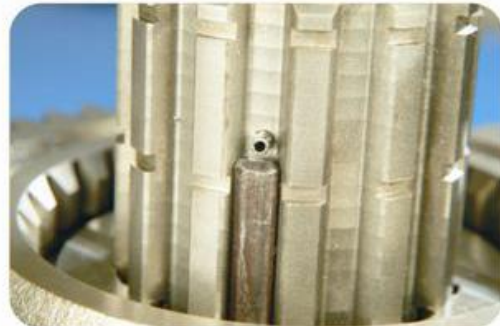
8. Mount 2nd gear onto main shaft, with meshing teeth downward, then a gasket, rotate one tooth distance, push the long key upward.



9. Mount 3rd gear onto main shaft, with meshing teeth upward, then a gasket, rotate one tooth distance, push the long key upward.



10. Mount spring pin of main shaft.



11. Mount one compounding of 3/4 synchronizer, then mount a clamp.
Note: the aperture of clamp aims at the groove with a hole.



12. Mount one hub of 3/4 synchronizer, then mount a clamp.
Note: the aperture of clamp averting the groove with a hole.



13. Mount another compounding of 3/4 speed synchronizer

5.3.2 Assemble and disassemble input shaft

1. Input shaft assembly of 16 speed transmission



2. Detach the clamp ring in inner hole of input gear.



3. Take off the gear of input shaft, and the spline gaskets beside it.



4. Detach the clamp ring in front of synchronizer.



5. Take off one compounding of synchronizer, detach the clamp ring of one side.



6. Direction of sliding bush and taper ring.
Note: Taper rings at both sides and constant-meshing teeth are not interchangeable.



7. Assemble input shaft.
Put input shaft vertically, mount a input gear, mount the gasket for input gear, with the flange side downward.



8. Mount a bearing of input shaft.

9. Put input shaft horizontally, mount a compounding of synchronizer, mount a clamp ring.



10. Mount a hub of synchronizer, then a clamp ring



11. Mount another compounding of synchronizer, then mount a clamp ring.



12. Install the spline gasket of input shaft.



13. Assemble input shaft gear and spline gasket, then add a clamp ring.



14. Baste anti-oxygen material on the screw of input shaft nut, fix it. Mark two opposite teeth of differential gear.



5.3.3 Assemble and disassemble the shift bar assembly

1. Detach the follower valve and parity cylinder' s pipe



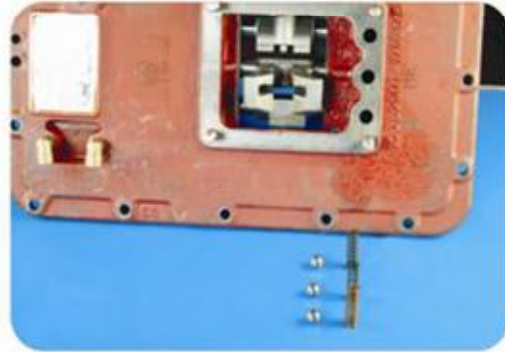
2. Detach bolts on the shift bar.



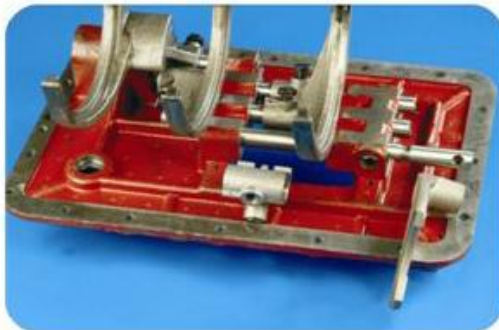
3. Screw off the bolts and take down the shift bar.



4. Take off 3 location spring and steel balls of shift bar housing.



5. Detach reverse yoke shaft, guide block, reverse yoke.



6. Detach 1/2 speed yoke and yoke shaft, take out the interlock steel ball inside the housing.
Note: there is interlock pin inside the hole of 1/2 yoke shaft.



7. Detach 3/4 speed yoke shaft, guide block and yoke, take out interlock steel balls inside the housing.



8. Detach the clamp ring inside shifting cylinder on shift bar housing.



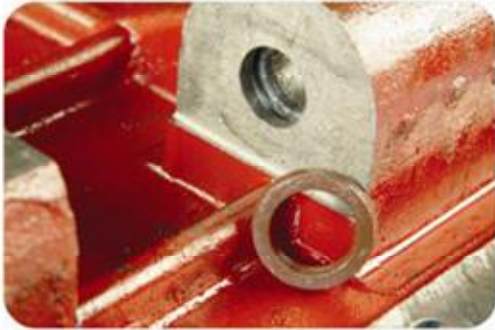
9. Knock yoke shaft of piston, take out spring and steel ball, take out yoke shaft of piston.



10. Y style sealing ring of yoke shaft and O style sealing ring of side cover.



11. Y sealing ring of parity shift cylinder of shift bar



12. Baste grease onto the Y sealing ring, install yoke shaft onto parity cylinder of shift bar.
Note: pay attention to direction of Y sealing ring



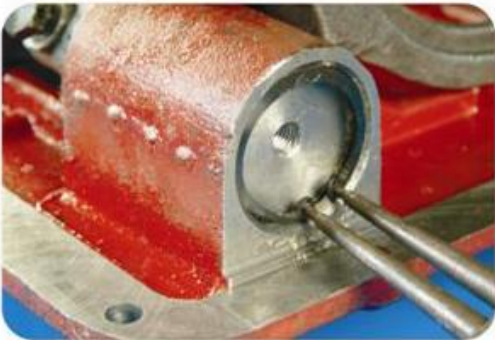
13. Mount a location steel ball into shift cylinder.
Note: spring is up and steel ball is down.



14. Install the side cover, with the flat side outward.



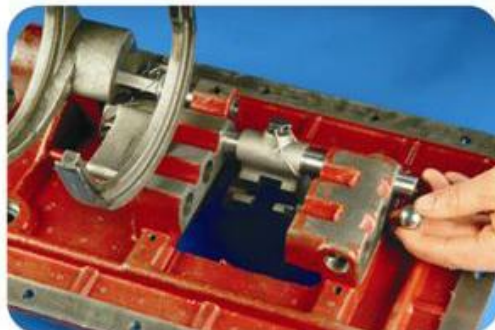
15. Mount the clamp ring onto parity shift cylinder.



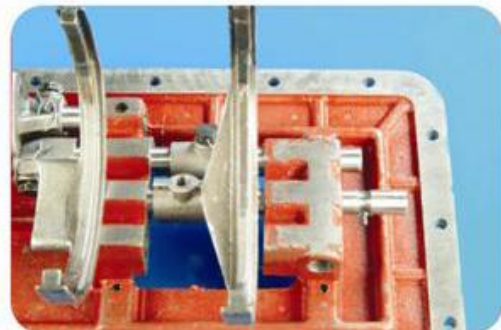
16. Mount a bolt on the yoke of parity shift cylinder, fasten with steel wire.



17. Mount 3/4 yoke shaft, guide block and yoke, fixing bolt, install a interlock steel ball.



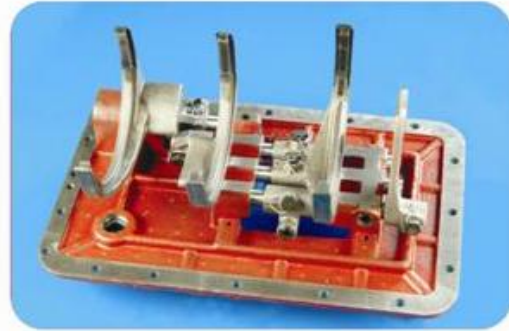
18. Mount 1/2 yoke and yoke shaft, install interlock pin.



19. Fasten 1/2 yoke and the bolt on guide block, fixing it with steel wire. Mount a steel ball.



20. Mount yoke shaft of reverse speed, guide block and reversing yoke. Fasten bolts.



21. Assemble the shift bar assembly.



22. Mount steel balls and springs for 3 holes of shift bar.
Note: springs in 3/4 speed yoke shaft are wider.



23. Fix the bolts on shift bar, connect single-H valve and air pipe.



5.3.4 Assemble 16 speed transmissions

1) Remote-control double-H assembly can refer to double-H assembly of twin countershafts transmission.

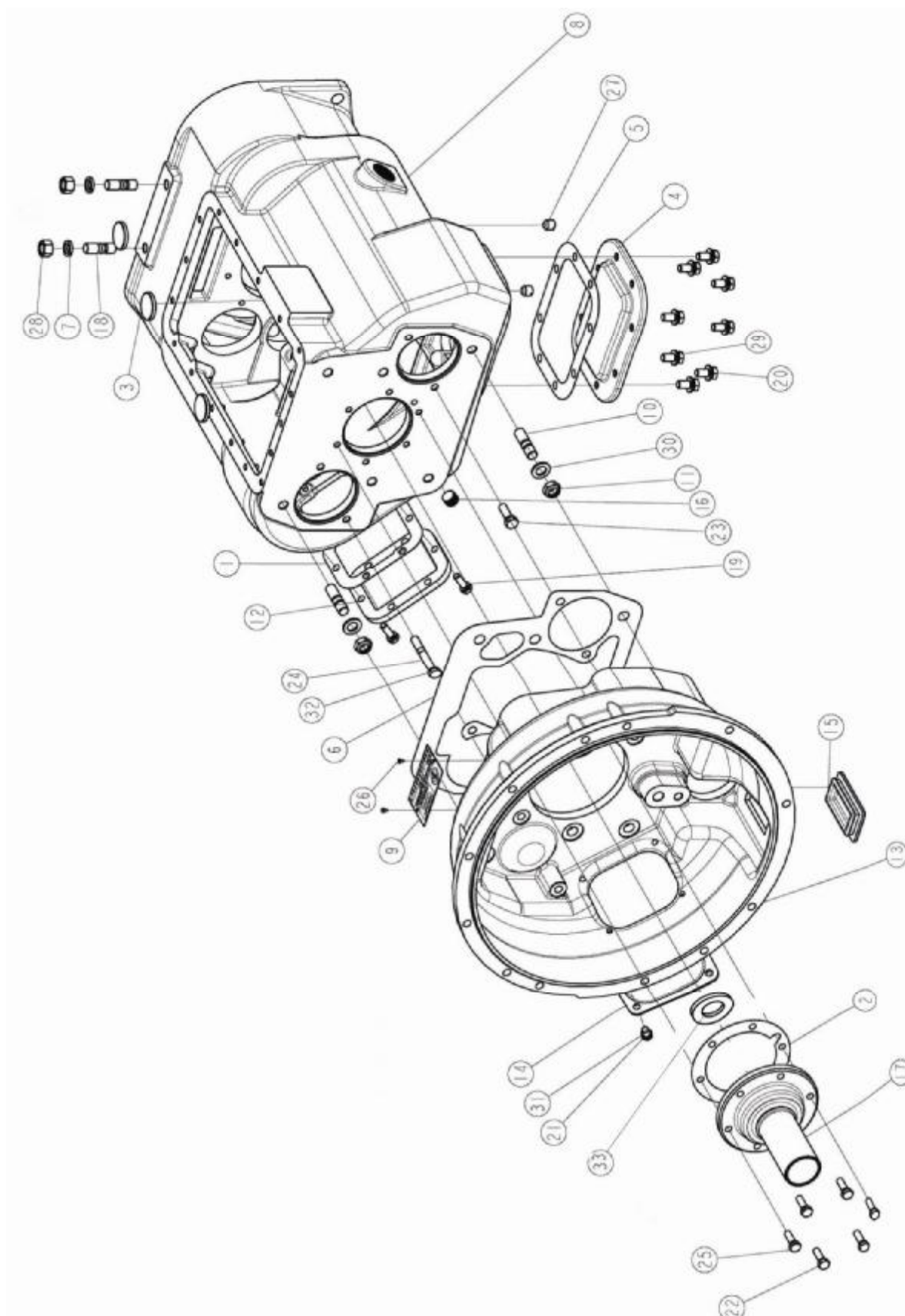
2) Assembly of 16 speed transmissions (including main and auxiliary case) can refer to Part 2, Chapter 6---assemble and disassemble 12 speeds transmissions

3) Timing procedure of main case of 16 speeds transmissions can choose 1st gear or differential gear of 1st gear, any one is OK. (See the illustration)



6 Parts Catalogue

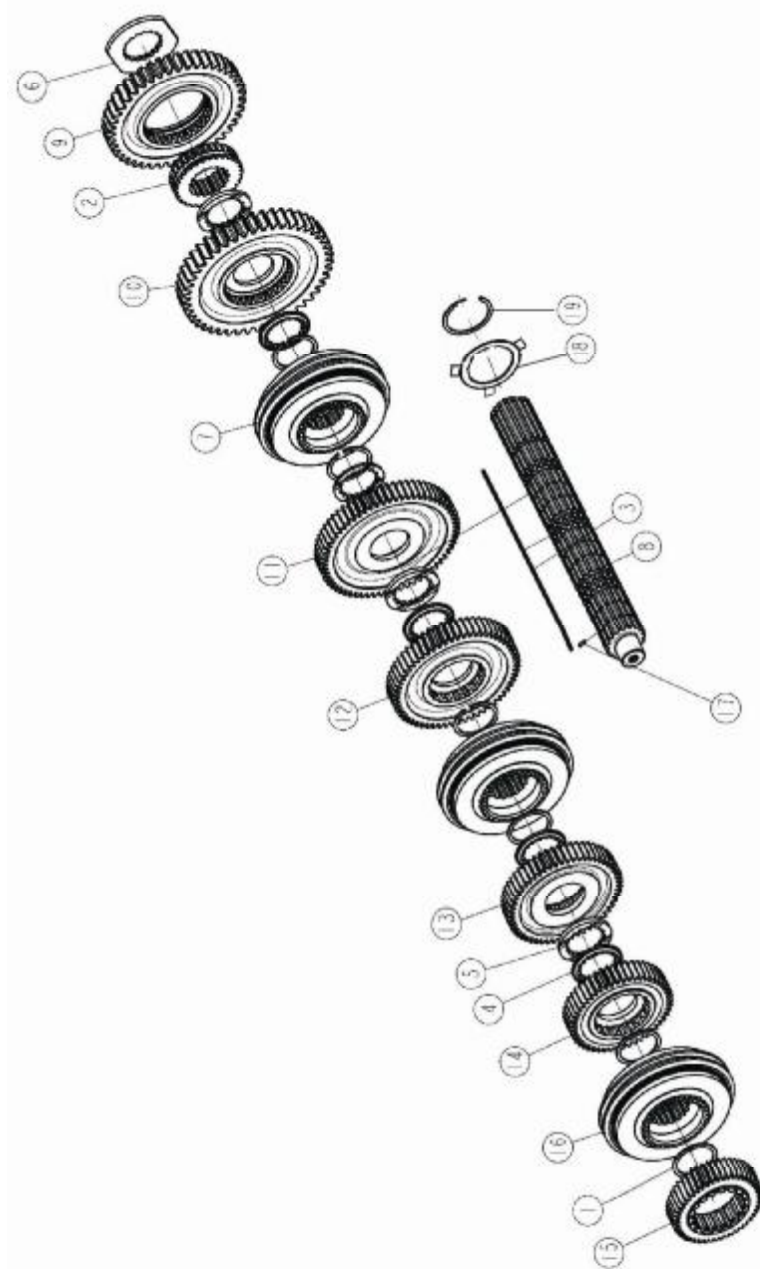
6.1 Clutch housing and transmission housing



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	1684	侧取力泵口衬垫	1	√	√	√	√	√	√	√	√	√
2	14311	一挂销芯套衬垫	1	√	√	√	√	√	√	√	√	√
3	14373	圆垫铁	3	√	√	√	√	√	√	√	√	√
4	16596	侧取力泵口盖	1	√	√	√	√	√	√	√	√	√
5	16929	侧取力泵口衬垫	1	√	√	√	√	√	√	√	√	√
6	20822	侧取力泵口衬垫	1	√	√	√	√	√	√	√	√	√
7	Q40316	高合体壳体衬垫	2	√	√	√	√	√	√	√	√	√
8	12JS160T-1701015	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
9	16896	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
10	12JS200T-1702021-3	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
11	GB890-80-M16X1.5	六角头螺栓	6	√	√	√	√	√	√	√	√	√
12	JS130T-1701020	六角头螺栓	1	√	√	√	√	√	√	√	√	√
13	JS180-1601015-6	侧取力泵口盖	1	√	√	√	√	√	√	√	√	√
14	A-3674	高合体壳体	1	√	√	√	√	√	√	√	√	√
15	JS180-1601016-1	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
16	JS180-1601016-2	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
17	JS180A-1701040-3	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
18	F91409	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
19	Q1231630	侧取力泵壳体	2	√	√	√	√	√	√	√	√	√
20	Q1421032	六角头螺栓和侧取力泵壳体	6	√	√	√	√	√	√	√	√	√
21	Q150B1025	六角头螺栓	4	√	√	√	√	√	√	√	√	√
22	Q150B1032	六角头螺栓	4	√	√	√	√	√	√	√	√	√
23	Q150B1238	六角头螺栓	2	√	√	√	√	√	√	√	√	√
24	Q150B1280	六角头螺栓	2	√	√	√	√	√	√	√	√	√
25	Q170B1032	六角头螺栓	2	√	√	√	√	√	√	√	√	√
26	Q2715608	六角头螺栓	2	√	√	√	√	√	√	√	√	√
27	Q2821616	十字槽盘头自攻螺钉	2	√	√	√	√	√	√	√	√	√
28	Q341B16	六角头螺栓	2	√	√	√	√	√	√	√	√	√
29	Q40112	六角头螺栓	8	√	√	√	√	√	√	√	√	√
30	Q40116	六角头螺栓	6	√	√	√	√	√	√	√	√	√
31	Q40310	六角头螺栓	10	√	√	√	√	√	√	√	√	√
32	Q40312	六角头螺栓	4	√	√	√	√	√	√	√	√	√
33	F500A-1802191	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√
	F91410	侧取力泵壳体	1	√	√	√	√	√	√	√	√	√

代号: NO.	零件号: Part NO.	零件名称: Part Name	数量: Quantity
1	侧取力窗口衬垫	gasket for PTO window	
2	一轴轴承盖衬垫	gasket of bearing cover of input shaft	
3	圆磁铁	round magnet	
4	底取力窗口盖	window cover of bottom PTO	
5	底取力窗口衬垫	window gasket of bottom PTO	
6	离合器壳体衬垫	gasket for clutch housing	
7	弹簧垫圈	spring gasket	
8	变速器壳体	transmission housing	
9	标牌	brand plate	
10	双头螺栓	bi-head bolt	
11	六角尼龙圈锁紧薄螺母	hex-nylon fastening bolt	
12	侧取力窗口盖	side PTO window cover	
13	离合器壳	clutch housing	
14	手孔盖	hand hole cover	
15	手孔盖	hand hole cover	
16	开槽锥形螺塞	groove taper bolt	
17	一轴轴承盖	bearing cover of input shaft	
18	双头螺柱	bi-head bolt	
19	六角头螺栓和弹簧垫圈组合圈	hex-bolt and spring gasket	
21	六角头螺栓	hex-bolt	
22	六角头螺栓	hex-bolt	
23	六角头螺栓	hex-bolt	
24	六角头螺栓	hex-bolt	
25	六角头头部带孔螺栓	hex bolt with hole on head	
26	十字槽盘头自攻螺钉	cross groove tapping bolt	
27	开槽平端紧钉螺钉	flat end bolt	
28	1 型六角螺母	hex nut of 1 type	
29	平垫圈	flat gasket	
30	平垫圈	flat gasket	
31	弹簧垫圈	spring gasket	
32	弹簧垫圈	spring gasket	
33	骨架油封总成	frame oil sealing	

6. 2、 Main shaft assembly



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	16703	止动环	6	√	√				√	√	√	√
2	12JS160T-170110B	衬套	5	√	√	√	√	√				
	JS150T-170110B	低倒档衬套	1			√	√	√				
	JS130T-170110B		1									
3	12JS160T-1701121	一轴六角轴	1	√	√	√	√	√	√	√	√	√
	JS150T-1701121B											
	JS130T-1701121B											
4	12JS160T-1701122	二轴齿花键轴	5	√	√	√	√	√	√	√	√	√
			4									

代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
5	12JS160T-1701123	二轴齿轮隔套	3	√	√	√	√	√	√	√	√	√
6	12JS160T-1701125 16701	二轴惰齿面轮垫片	4 2	√	√	√	√	√	√	√	√	√
7	12JS160T-1701170 JS132T-1701180	一二轴同步器总成	1	√	√	√	√	√	√	√	√	√
8	12JS200T-1701105 JS152T-1701105B JS132T-1701105B	二轴	1	√	√	√	√	√	√	√	√	√
9	12JS200T-1701110 JS152T-1701105B JS119T-1701105B	二轴惰齿面轮	1	√	√	√	√	√	√	√	√	√
10	JS100-1701111 12JS200T-1701111 JS152T-1701111B JS135T-1701111B JS119T-1701111B JS102T-1701112B	二轴一档齿轮	1	√	√	√	√	√	√	√	√	√
11	JS132T-1701112B 12JS200T-1701112 JS152T-1701112B JS119T-1701112B JS102T-1701112B	二轴二档齿轮	1	√	√	√	√	√	√	√	√	√
12	JS132T-1701130B 12JS200T-1701113 JS152T-1701113B JS135T-1701113B JS119T-1701113B JS102T-1701113B	二轴三档齿轮	1	√	√	√	√	√	√	√	√	√
13	JS102TA-1701131B JS132T-1701131B JS132TA-1701131B	二轴超变档齿轮							√	√	√	√
14	12JS200T-1701114 12JS160T-1701115-1 12JS200T-1701116-1	二轴超变档齿轮 二轴四档齿轮 二轴五档齿轮	1 1 1	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √	√ √ √
15	12JS160T-1701116-1 JS152T-1701131B JS135T-1701031B JS119T-1701031B JS102T-1701031B JS132T-1701031B	一档齿轮	1	√	√	√	√	√	√	√	√	√
16	JS132TA-1701031B JS132T-1701180	三四档同步器总成	2	√	√	√	√	√	√	√	√	√
17	C62903-0	弹性圆柱销	1	√	√	√	√	√	√	√	√	√
18	12JS160T-1701106	主轴齿轮衬套	1	√	√	√	√	√	√	√	√	√
19	12JS160T-1701107 JS152T-1701112B JS119T-1701113B	带齿衬套卡环 二轴低档齿轮	1 1	√ √	√ √	√ √	√ √	√ √	√ √	√ √	√ √	√ √

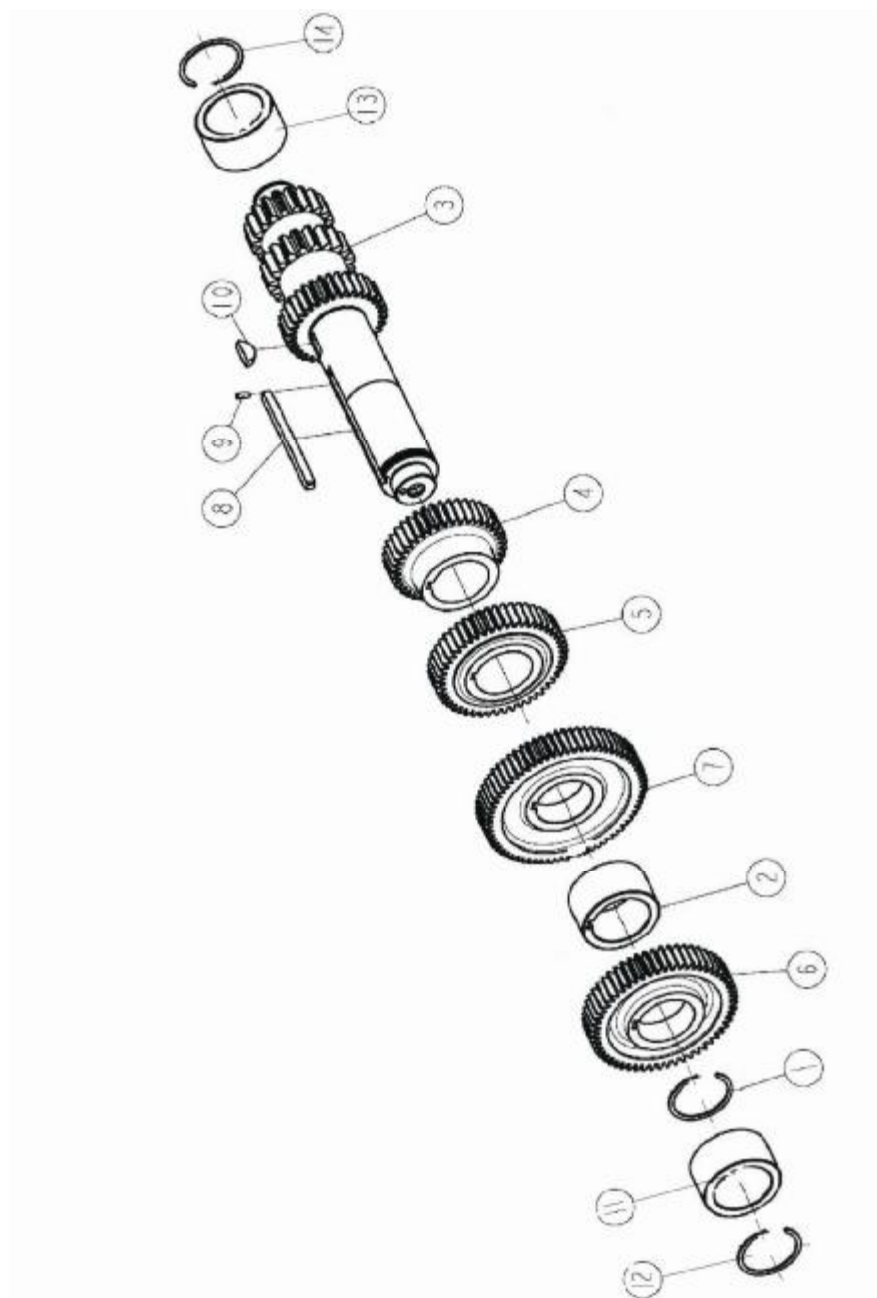
1 止动环 stop ring

2 滑套 sliding bush

低倒档滑套 sliding bush of low-reverse sliding bush

-
- 3 二轴六角键 hex-key of main shaft
 - 4 二轴齿轮花键垫 spline gasket of main shaft gear
 - 5 二轴齿轮隔垫 gasket of main shaft gear
 - 6 二轴倒档齿轮垫片 gasket for reverse gear of main shaft
 - 7 一二档同步器总成 1/2 speed synchronizer
 - 8 二轴 main shaft
 - 9 二轴倒档齿轮 reverse gear of main shaft
 - 10 二轴一档齿轮 1st gear of main shaft
 - 11 二轴二档齿轮 2nd gear of main shaft
 - 12 二轴三档齿轮 3rd gear of main shaft
 - 二轴超速档齿轮 over speed gear of main shaft
 - 13 二轴四档齿轮 4th gear of main shaft
 - 14 二轴五档齿轮 5th gear of main shaft
 - 15 一轴齿轮 gear of input shaft
 - 16 三四档同步器总成 3/4 speed synchronizer assembly
 - 17 弹性圆柱销 spring cylinder pin
 - 18 主轴齿轮垫圈 gasket of main shaft gears
 - 19 倒档齿轮卡环 clamp ring of reverse gear
 - 二轴低档齿轮 low speed gear of main shaft

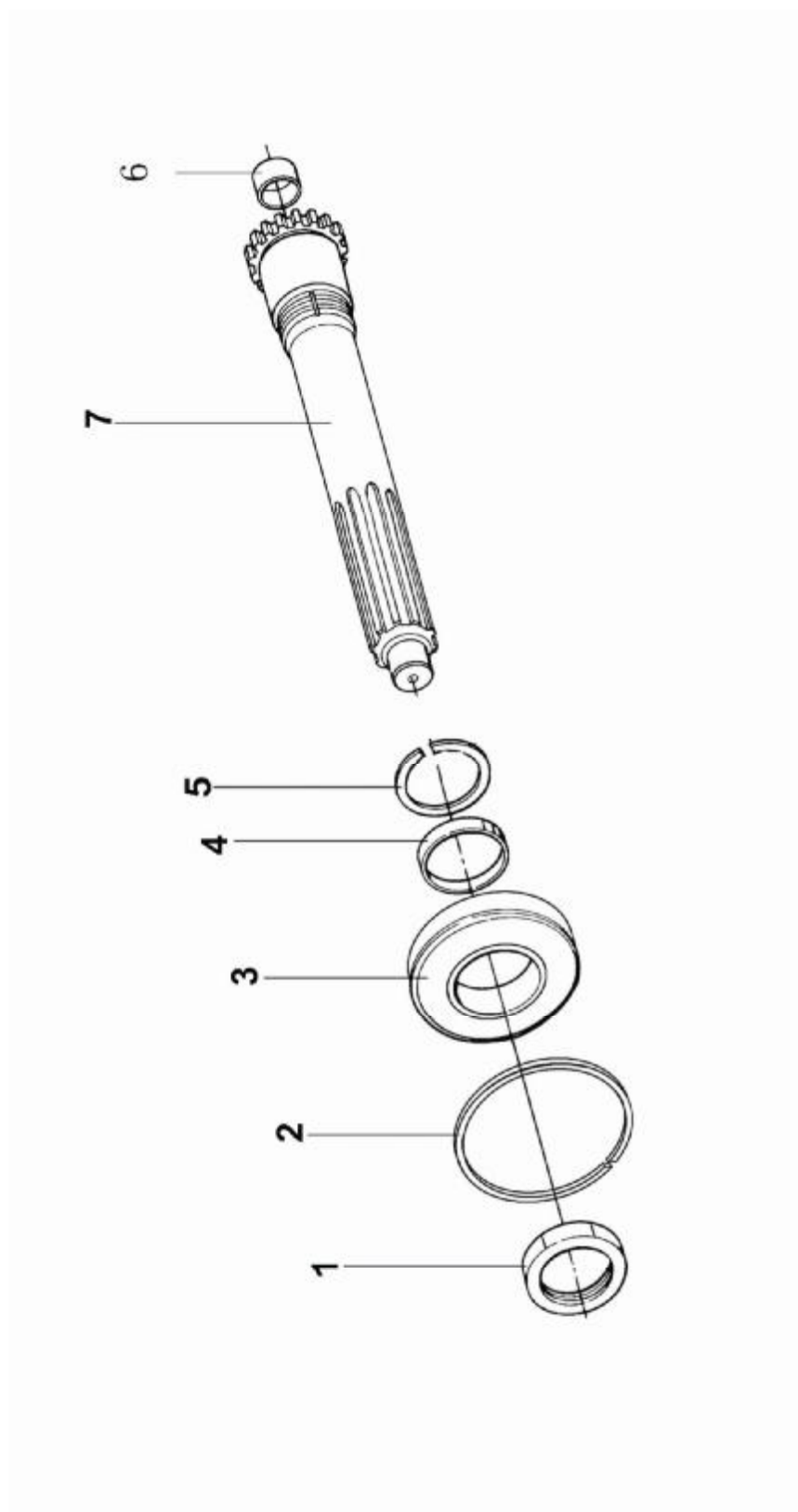
Section 3, countershaft assembly



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	9198	中间轴止动环	2	√	√	√	√	√	√	√	√	√
2	12JS160T-1701057	圆套	2	√	√	√	√	√	√	√	√	√
3	12JS200T-1701048	中间轴	2	√	√	√	√	√	√	√	√	√
	JS150T-17010488					√	√	√	√	√	√	√
	JS119T-17010488							√				
4	JS130T-17010488	中间轴三相齿轮	2	√	√	√	√	√	√	√	√	√
	JS180T-17010518					√	√	√	√	√	√	√
	JS135T-17010518						√	√	√	√	√	√
	JS119T-17010518							√	√	√	√	√
	JS100T-17010518								√	√	√	√
	JS100TA-17010518	中间轴三相齿轮								√	√	√
	JS130T-17010518										√	√
5	JS130TA-17010518	中间轴三相齿轮	2	√	√							
6	12JS200T-1701051	中间轴三相齿轮	2	√	√							
	12JS200T-1701052	中间轴三相齿轮				√						
	JS150T-17010568						√	√				
	JS135T-1701054							√				
	JS119T-1701054								√	√		
	JS100T-17010568									√	√	
	JS100TA-17010568										√	√
	JS130T-17010568											
7	12JS200T-1701052	中间轴三相齿轮	2	√	√							
8	12JS200T-1701056	中间轴三相齿轮	2	√	√							
	16JS200T-1701055	中间轴三相齿轮				√	√	√	√	√	√	√
	19673					√	√	√	√	√	√	√
9	05280514	弹性圆柱销	2	√	√	√	√	√	√	√	√	√
10	X-3-E	半圆键	2	√	√	√	√	√	√	√	√	√
11	192309E	轴端柱销子轴承	4	√	√	√	√	√	√	√	√	√
12	370309V	轴端柱销子轴承	4	√	√	√	√	√	√	√	√	√
13	C01021	止动环	4	√	√							
14	102309E	轴端柱销子轴承	4	√	√	√	√	√	√	√	√	√
	102308E											
	Q43145	轴端柱销子轴承	4	√	√	√	√	√	√	√	√	√
	14317											

-
- 1 中间轴止动环 stop ring of countershaft
 - 2 隔套 baffle sleeve
 - 3 中间轴 countershaft
 - 4 中间轴三档齿轮 3rd gear of counter shaft
中间轴超速档齿轮 over speed gear of countershaft
中间轴超速档齿轮 over speed gear of countershaft
 - 5 中间轴四档齿轮 4th gear of countershaft
 - 6 中间轴传动齿轮 drive gear of countershaft
 - 7 中间轴五档齿轮 5th gear of countershaft
 - 8 中间轴四方键 square key of countershaft
 - 9 弹性圆柱销 spring cylinder pin
 - 10 半圆键 semi-cylinder key
 - 11 短圆柱滚子轴承 short cylinder bearing
 - 12 止动环 stop ring
 - 13 短圆柱滚子轴承 short cylinder bearing
 - 14 轴用弹性挡圈 spring baffle plate for shafts

Section 4, input shaft assembly



- 1 一轴螺母 nut of input shaft
 2 止动环 stop ring
 3 单列向心球轴承 centripetal ball bearing
 4 齿轮隔垫 gasket of gears

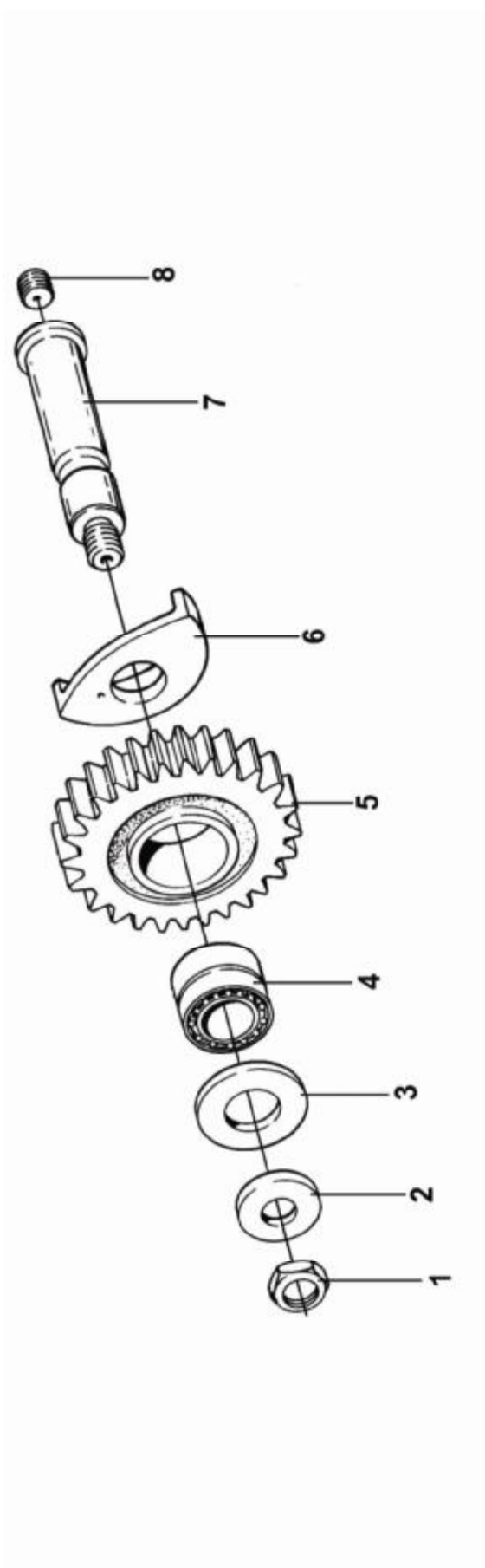
代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	JS180A-1701030	一轴螺母	1	√	√	√	√	√	√	√	√	√
2	865B	止动环	1	√	√	√	√	√	√	√	√	√
3	CO1030	单列向心球轴承	1	√	√	√	√	√	√	√	√	√
4	15C212K	齿轮隔垫	1	√	√	√	√	√	√	√	√	√
5	14463	齿轮隔垫	1	√	√	√	√	√	√	√	√	√
6	14750	止动环	1	√	√	√	√	√	√	√	√	√
7	16566	二轴螺母	1	√	√	√	√	√	√	√	√	√
	JS180A-1701030	一轴	1	√	√	√	√	√	√	√	√	√
	19604											

5 止动环 stop ring

6 二轴导套 guide sleeve of main shaft

7 一轴 input shaft

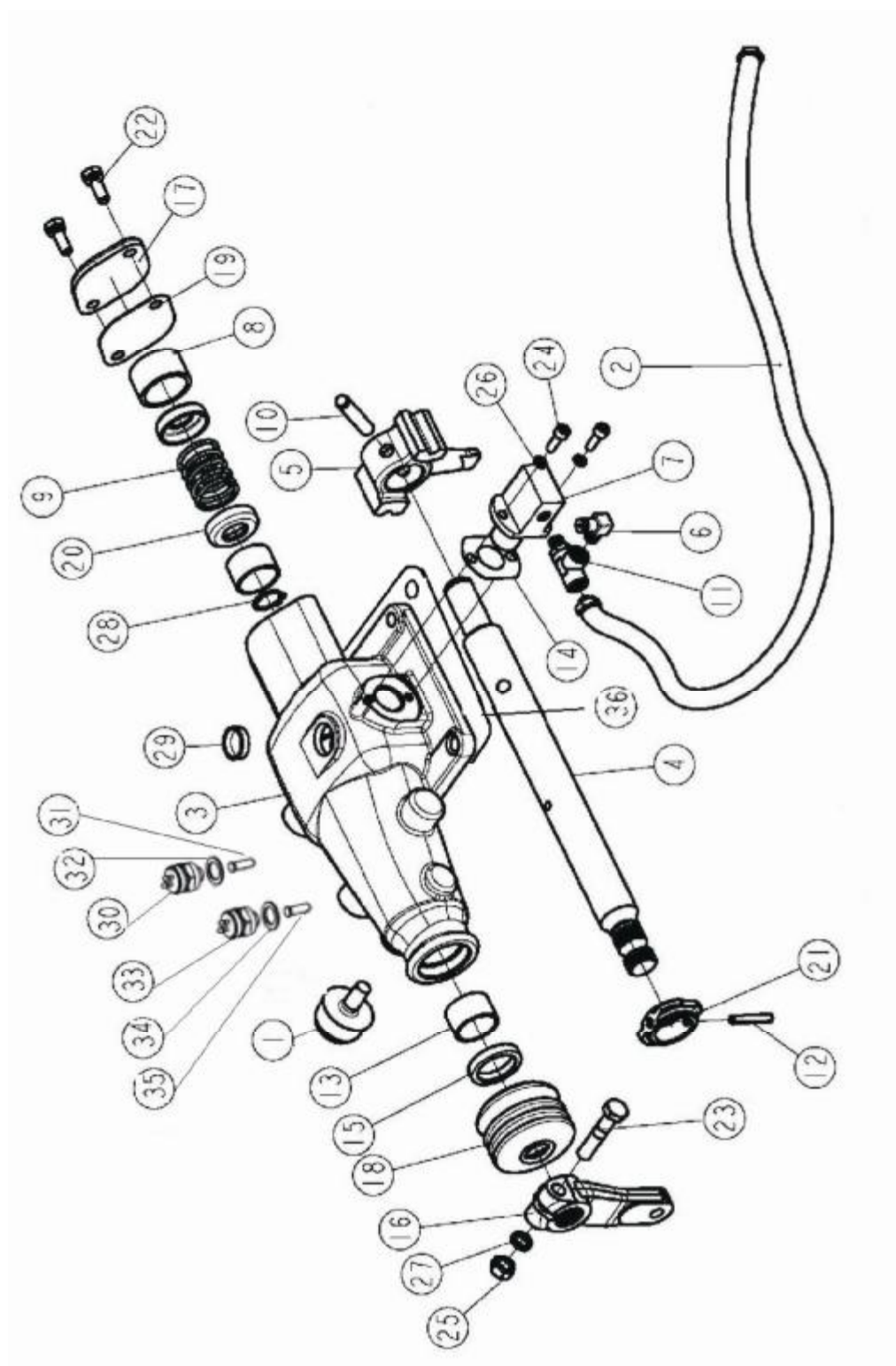
Section 5 countershaft assembly of reverse speed



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	GB890-86	螺母1/20×1.5	2	√	√	√	√	√	√	√	√	√
2	GB890-80	六角螺母 M16×1.5	2	√	√	√	√	√	√	√	√	√
3	JS220-1701068	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
4	JS220-1701067	倒档止推套圈	2	√	√	√	√	√	√	√	√	√
5	DS100-1701085	滚针轴承	2	√	√	√	√	√	√	√	√	√
6	14287	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
7	JS150T-1701083	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
8	JS119T-1701083B	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
9	JS100-1701082	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
10	12JS160T-1701084	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
11	16403	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
12	JS220-1701082	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
13	16405	倒档中间轴轴套	2	√	√	√	√	√	√	√	√	√
14	Q2821212	平端固定螺钉	2	√	√	√	√	√	√	√	√	√

1 螺母 M20 x 1.5	nut M20 x 1.5
六角螺母 M16 x 1.5	nut M16 x 1.5
2 倒档中间轴垫圈	gasket of reverse countershaft
3 倒档止推垫圈	thrust gasket ring of reverse speed
4 滚针轴承	roller bearing
5 倒档中间齿轮	countershaft gears of reverse gear
6 环形倒档垫圈	gasket ring of reverse speed
7 倒档中间轴	reverse countershaft
8 平端紧钉螺钉	flat bolt

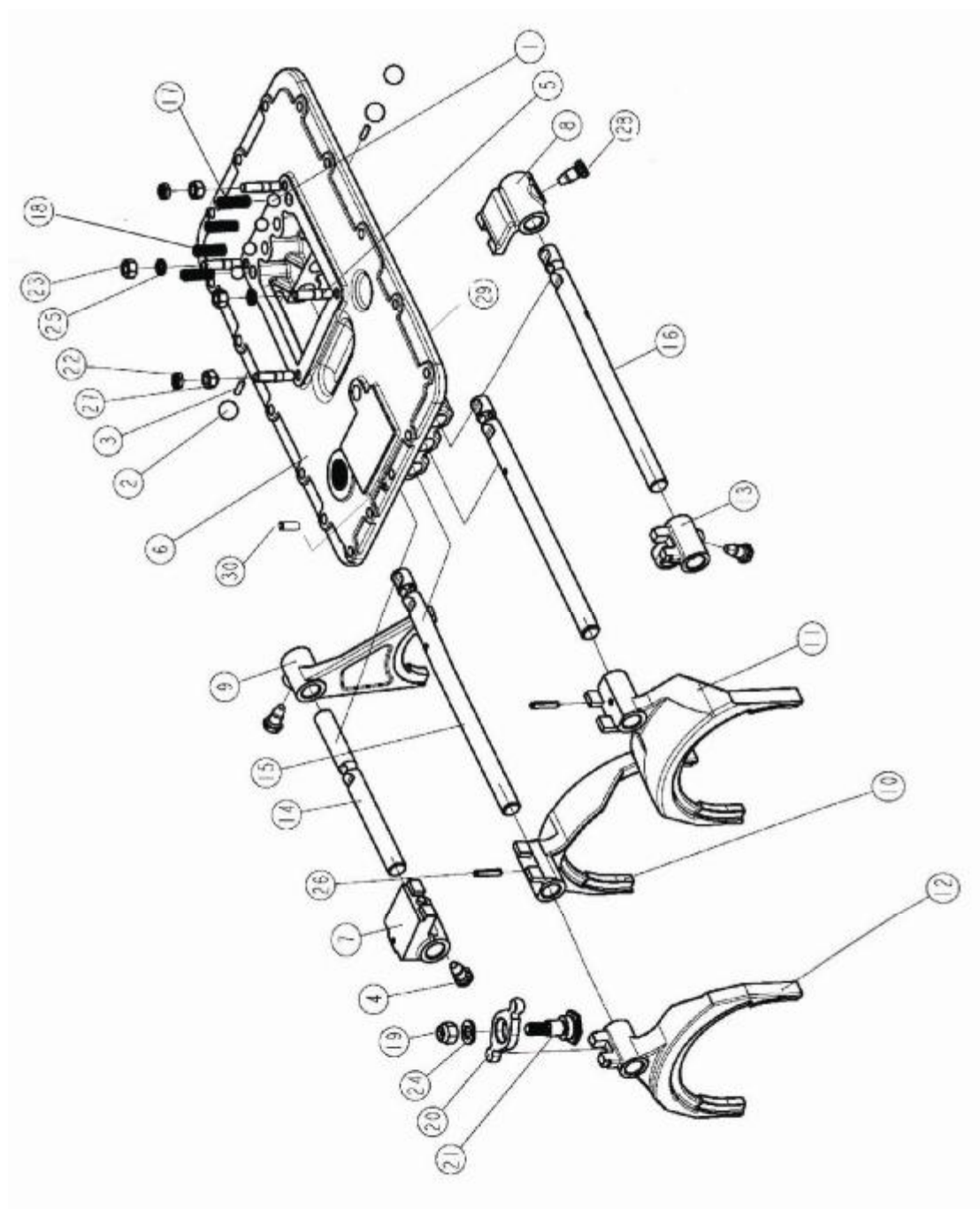
Section 6 assembly of control device



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	15276	进气塞	1	√	√	√	√	√	√	√	√	√
2	55534	气塞总成	1	√	√	√	√	√	√	√	√	√
3	12JS160T-1703015	接线装置壳体	1	√	√	√	√	√	√	√	√	√
4	F96194	橡胶软管	1	√	√	√	√	√	√	√	√	√
5	F96679	橡胶软管	1	√	√	√	√	√	√	√	√	√
6	F96595	橡胶软管	1	√	√	√	√	√	√	√	√	√
7	12JS160T-1703021	橡胶软管	1	√	√	√	√	√	√	√	√	√
8	12JS160T-1703022	橡胶软管	1	√	√	√	√	√	√	√	√	√
9	12JS160T-1703027	橡胶软管	1	√	√	√	√	√	√	√	√	√
10	C03030	圆柱销	1	√	√	√	√	√	√	√	√	√
11	C03052	三通管接头	1	√	√	√	√	√	√	√	√	√
12	C03035	弹性圆柱销	1	√	√	√	√	√	√	√	√	√
13	F91345	弹性圆柱销	2	√	√	√	√	√	√	√	√	√
14	F91353	弹性圆柱销	1	√	√	√	√	√	√	√	√	√
15	F91444	弹性圆柱销	1	√	√	√	√	√	√	√	√	√
16	F96035	橡胶软管	1	√	√	√	√	√	√	√	√	√
17	F96695-2	橡胶软管	1	√	√	√	√	√	√	√	√	√
18	F96699	橡胶软管	1	√	√	√	√	√	√	√	√	√
19	F96672-2	橡胶软管	1	√	√	√	√	√	√	√	√	√
20	F96673-1	橡胶软管	2	√	√	√	√	√	√	√	√	√
21	F96681	橡胶软管	1	√	√	√	√	√	√	√	√	√
22	Q1420022	六角头螺栓和垫圈组合件	2	√	√	√	√	√	√	√	√	√
23	Q151B1050	六角头螺栓-细牙	1	√	√	√	√	√	√	√	√	√
24	Q218B0618	内六角圆柱头螺钉	2	√	√	√	√	√	√	√	√	√
25	Q341B10	1型六角螺母	1	√	√	√	√	√	√	√	√	√
26	Q40C06	弹簧垫圈	2	√	√	√	√	√	√	√	√	√
27	Q40G10	弹簧垫圈	1	√	√	√	√	√	√	√	√	√
28	Q43120	轴用弹性挡圈	1	√	√	√	√	√	√	√	√	√
29	Q72224	轴用弹性挡圈	1	√	√	√	√	√	√	√	√	√
30	Q041K5	压力开关	1	√	√	√	√	√	√	√	√	√
31	F99702	开关启动销	1	√	√	√	√	√	√	√	√	√
32	Q72318T3	密封垫圈	1	√	√	√	√	√	√	√	√	√
33	Q0680S	压力开关	1	√	√	√	√	√	√	√	√	√
34	C03015	橡胶软管	1	√	√	√	√	√	√	√	√	√
35	15889	橡胶软管	1	√	√	√	√	√	√	√	√	√
36	1642	橡胶软管	1	√	√	√	√	√	√	√	√	√

1 通气管	air pipe
2 气管总成	pipe assembly
3 操作装置壳体	housing of control device
4 横向换挡杆	horizontal shift lever
5 拨头	shifting block
6 90 度快换接头	90 degree shift connector
7 气路控制阀	air-routine control valve
8 限位套	location sleeve
9 压缩弹簧	compressed spring
10 圆柱销	cylinder pin
11 三通管接头	3 way connector
12 弹性圆柱销	spring cylinder pin
13 横向换挡杆衬套	horizontal sleeve of shift lever
14 双 H 气阀衬垫	valve gasket of double H
15 油封	oil seal
16 LRC 外换挡臂	LRC shifting arm
17 侧板	side plate
18 套	bush
19 端垫	end gasket
20 弹簧座	spring pedestal
21 低倒档开关控制块	switch control of low-reverse speed
22 六角头螺栓和弹簧垫圈组合件	hex bolt and spring gasket
23 六角头螺栓—细牙	hex bolt (fine teeth)
24 内六角圆柱头螺钉	hex cylinder bolt
25 1 型六角螺母	hex nut of 1 nut
26 弹簧垫圈	spring gasket
27 弹簧垫圈	spring gasket
28 轴用弹性挡圈	spring baffle ring for shaft
29 碗行塞片	bowl shim
30 压力开关	pressing switch
31 开关启动销	launch pin of switch
32 密封垫圈	sealing gasket
33 压力开关	press switch
34 垫密圈	sealing gasket
35 开关启动销	launch pin of switch
36 操纵窗口衬垫	gasket for control window

Section 7 assembly of shift bar

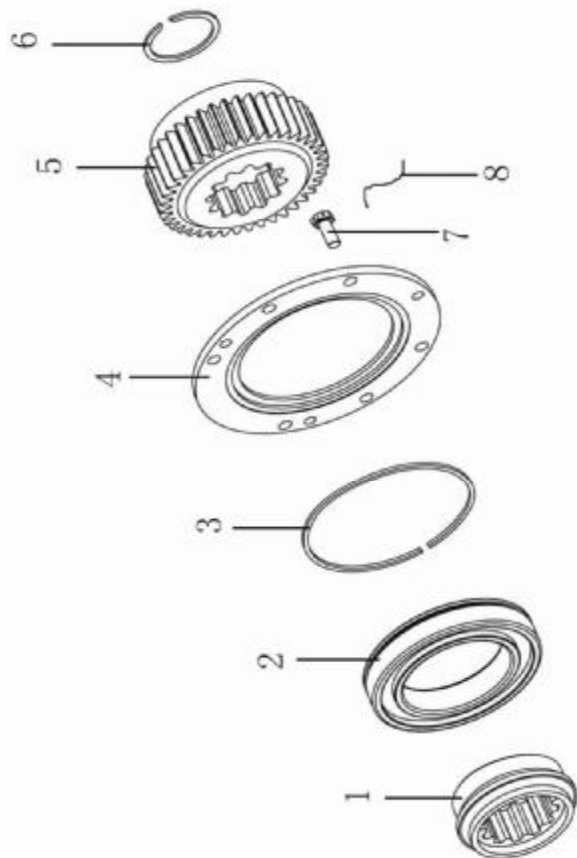


代号	零件号	零件名称	数量	12JS200T	12JS200TA	8JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	12.7G-100GB-1308	钢球	4	√	√	√	√	√	√	√	√	√
2	19.05G-100GB-1308	钢球	3	√	√	√	√	√	√	√	√	√
3	1634	拨叉轴联锁销	2	√	√	√	√	√	√	√	√	√
4	3220	拨档拔叉轴止螺钉	1	√	√	√	√	√	√	√	√	√
5	11056	固定销轴	4	√	√	√	√	√	√	√	√	√
6	12.5160T-1702015	上盖	1	√	√	√	√	√	√	√	√	√
7	JS130T-1702015									√		√
8	JS100A-1702015	物料导块总成	1	√	√							
9	12.5160T-1702050	五六档导块	1	√	√							
10	12.5160T-1702054	拨档拔叉	1	√	√							
11	JS150T-1702054B	红铜档拨叉	1	√	√	√	√	√	√	√	√	√
12	12.5160T-1702058	一二档拨叉	1	√	√	√	√	√	√	√	√	√
13	JS150T-1702058B											
14	JS130T-1702058-1	三四档拨叉	1	√	√	√	√	√	√	√	√	√
15	JS130T-1702058B											
16	JS130T-1702058B	五六档拨叉	1	√	√	√	√	√	√	√	√	√
17	12.5160T-1702064	五六档拨叉轴	1	√	√	√	√	√	√	√	√	√
18	JS150T-1702064	三四档拨叉轴	1	√	√	√	√	√	√	√	√	√
19	JS130T-1702064	一二档拨叉轴	1	√	√	√	√	√	√	√	√	√
20	JS130T-1702064B											
21	JS130T-1702064B	五六档拨叉轴	1	√	√	√	√	√	√	√	√	√
22	JS130T-1702064B	三四档拨叉轴	1	√	√	√	√	√	√	√	√	√
23	JS130T-1702064B	一二档拨叉轴	1	√	√	√	√	√	√	√	√	√
24	JS130T-1702064B											
25	JS130T-1702064B	五六档拨叉轴	1	√	√	√	√	√	√	√	√	√
26	JS150T-1702064B	三四档拨叉轴	1	√	√	√	√	√	√	√	√	√
27	JS130T-1702064B	一二档拨叉轴	1	√	√	√	√	√	√	√	√	√
28	JS130T-1702064B											
29	JS130T-1702064B	五六档拨叉轴	1	√	√	√	√	√	√	√	√	√
30	JS130T-1702064B	三四档拨叉轴	1	√	√	√	√	√	√	√	√	√

- 1 钢球 steel ball
2 钢球 steel ball
3 拨叉轴联锁销 interlock pin of yoke shaft

4	换挡拨叉锁止螺钉	lock bolt of shift lock
5	双头螺栓	bi-head bolt
6	上盖	shift bar
7	倒档导块总成	guide block of reverse speed
8	五六档导块	guide block of 5/6 speed
9	倒档拨叉	reverse yoke
	低倒档拨叉	low-reverse yoke
10	一二档拨叉	yoke of 1/2 speed
11	三四档拨叉	yoke of 3/4 speed
12	五六档拨叉	yoke of 5/6 speed
13	五六档换挡导块	shifting block of 5/6 speed
14	倒档拨叉轴	yoke shaft of reverse speed
15	一二三四档拨叉轴	yoke shaft of 1/2/3/4
	一二档拨叉轴	yoke shaft of 1/2 speed
16	五六档拨叉轴	yoke shaft of 5/6 speed
	三四档拨叉轴	yoke shaft of 3/4 speed
17	压缩弹簧	compressed spring
18	压缩弹簧	compressed spring
19	六角尼龙圈锁紧螺母	hex nylon fastening nut
20	摆动拨头	swing block
21	支撑轴销	supporting shaft pin
22	六角薄螺母	hex thin nut
23	2 型六角螺母	hex nut of 2 type
24	平垫圈	flat gasket
25	弹簧垫圈	spring gasket
26	弹性圆柱销	spring cylinder pin
27	六角螺母	hex nut
28	换挡拨叉锁止螺钉	fixing bolt of shift yoke
29	上盖衬垫	gasket of shift bar
30	圆柱销	cylinder pin

Section 8 Assembly of drive gear in auxiliary case



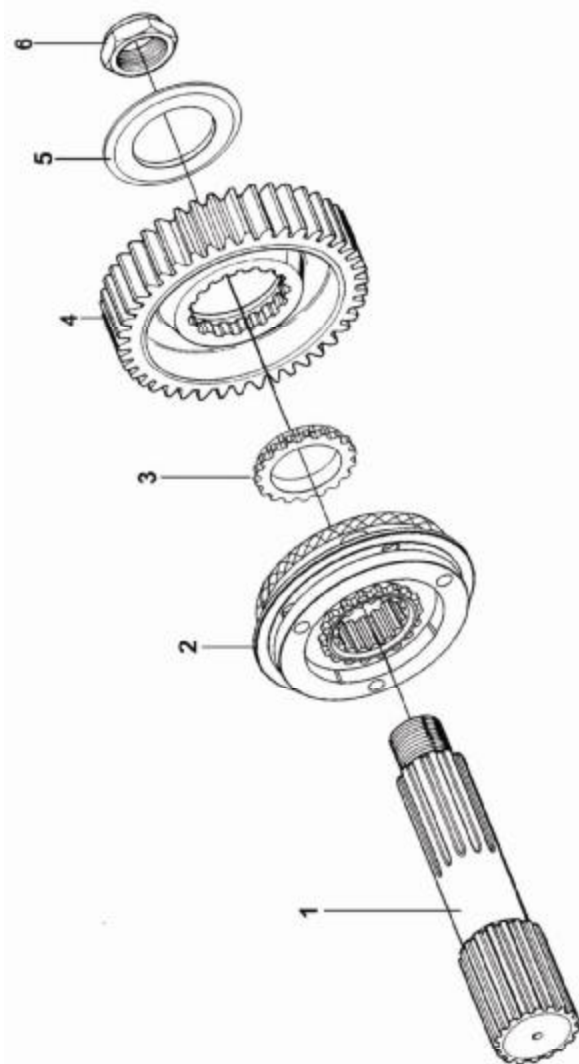
- 1 轴承支座
- 2 带止动槽的单列向心球轴承
- 3 止动环
- 4 副箱轴承定位盘
- 5 副箱驱动齿轮
- 6 止动环

- bearing pedestal
- centripetal ball bearing with a stop groove
- stop ring
- locate panel of auxiliary bearing
- drive gear of auxiliary case
- stop ring

代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	12JS160T-170T124	轴承支座	1	√	√	√	√	√	√	√	√	√
2	50118	带止动槽的单列向心球轴承	1	√	√	√	√	√	√	√	√	√
3	C01019	止动环	1	√	√	√	√	√	√	√	√	√
4	JS220-170T031	副箱轴承定位盘	1	√	√	√	√	√	√	√	√	√
	16136	副箱轴承定位盘	1	√	√	√	√	√	√	√	√	√
5	12JS200T-170T030	副箱驱动齿轮	1	√	√	√	√	√	√	√	√	√
	JS150T-170T030B	副箱驱动齿轮	1	√	√	√	√	√	√	√	√	√
	JS119T-170T030B	副箱驱动齿轮	1	√	√	√	√	√	√	√	√	√
6	16103	止动环	1	√	√	√	√	√	√	√	√	√
7	C01002	带止动槽的单列向心球轴承	6	√	√	√	√	√	√	√	√	√
8	16119	止动环	按需要	√	√	√	√	√	√	√	√	√

7 六角头头部带孔螺栓	hex bolt with a hole in head
8 铁丝	steel wire

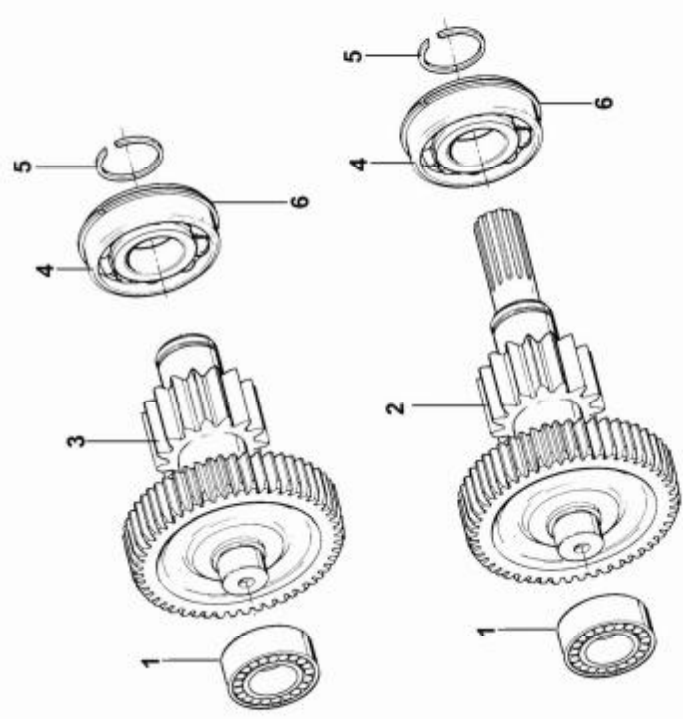
Section 9 Assembly of main shaft of auxiliary case



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	12JS200T-1707105 P99682	副轴主销	1	√	√	√	√	√	√	√	√	√
2	12JS160T-1707140 A-5065	高齿柱同步齿总泵	1	√	√	√	√	√	√	√	√	√
3	12JS200T-1707107 14331	副轴主销齿圈	1	√	√	√	√	√	√	√	√	√
4	14332 12JS200T-1707106 19726	副轴主销减速齿轮	1	√	√	√	√	√	√	√	√	√
	JS100T-1707120 JS130T-1707120								√			√
5	12JS160T-1707108 19466	副轴主销齿压板	1	√	√	√	√	√	√	√	√	√
6	P96006	凸缘螺母	1	√	√	√	√	√	√	√	√	√

- | | |
|------------|--|
| 1 副箱主轴 | main shaft of auxiliary case |
| 2 高低档同步器总成 | high-low speed synchronizer |
| 3 副箱主轴垫圈 | gasket for main shaft of auxiliary case |
| 4 副箱主轴减速齿轮 | reduction gear of main shaft, auxiliary case |
| 5 副箱主轴齿轮压板 | press slate for main shaft, auxiliary case |
| 6 凸缘螺母 | flange nut |

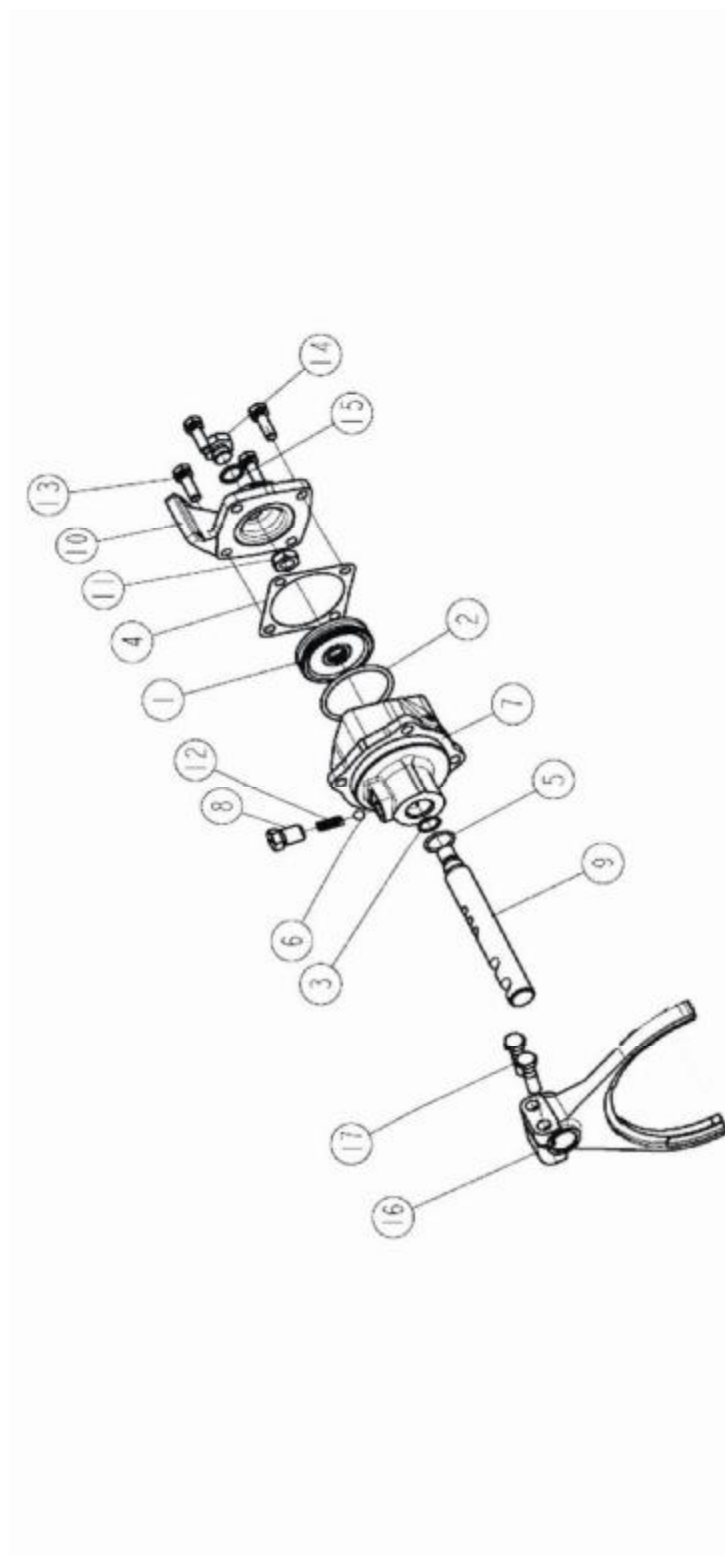
Section 10 Assembly of countershaft, auxiliary case



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	42302E	副箱轴衬套	2	√	√	√	√	√	√	√	√	√
2	42307E 12JS200T-17075A17 A-4794	副箱轴衬套衬套	1	√	√	√	√	√	√	√	√	√
	A-5119		2									
3	42307E-17075A48 12JS200T-1707550 JS150T-1707548B A-038019	副箱轴衬套衬套	1	√	√	√	√	√	√	√	√	√
4	192311E	副箱轴衬套	2	√	√	√	√	√	√	√	√	√
5	192311E JS180-1707551 18222	衬套	2	√	√	√	√	√	√	√	√	√
6	08305-42 17384	凸缘螺母	2	√	√	√	√	√	√	√	√	√

1 短圆柱滚子轴承	roll bearing of short cylinder
2 副箱加长中间轴焊接总成	weld assembly of lengthened countershaft, aux. case
3 副箱中间轴焊接总成	weld assembly of countershaft, aux. case
4 短圆柱滚子轴承	roll bearing of short cylinder
5 止动环	stop ring
6 止动环 120/129.7	stop ring 120/129.7

Section 11 shift cylinder assembly of auxiliary case



代号	零件号	零件名称	数量	12JS2000T	12JS2000TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	14341	范围档气缸活塞	1	√	√	√	√	√	√	√	√	√
2	14344	O型密封圈	1	√	√	√	√	√	√	√	√	√
3	14345	O型密封圈	1	√	√	√	√	√	√	√	√	√
4	14346	气缸盖密封垫	1	√	√	√	√	√	√	√	√	√
5	14766	O型密封圈	1	√	√	√	√	√	√	√	√	√
6	10G1005GB-T308	钢球	1	√	√	√	√	√	√	√	√	√
7	12JS160T-1707062	范围档气缸	1	√	√	√	√	√	√	√	√	√
8	12JS160T-1707063	活塞	1	√	√	√	√	√	√	√	√	√
9	12JS160T-1707061	活塞销及轴	1	√	√	√	√	√	√	√	√	√
10	16663	副活塞销及轴	1	√	√	√	√	√	√	√	√	√
11	Q8180-80-M16X1.5	六角头金属管接头螺母	1	√	√	√	√	√	√	√	√	√
12	J80-1703080	五方螺母	1	√	√	√	√	√	√	√	√	√
13	Q1421032M	六角头螺栓	4	√	√	√	√	√	√	√	√	√
14	Q06K35	压力开关	1	√	√	√	√	√	√	√	√	√
15	X11511	限位开关	1	√	√	√	√	√	√	√	√	√
16	16775	限位开关	1	√	√	√	√	√	√	√	√	√
17	Q171B1220	六角头金属管接头螺母	2	√	√	√	√	√	√	√	√	√

1 范围档气缸活塞

cylinder piston of range speed

2 O型密封圈

O sealing ring

3 O型密封圈

O sealing ring

4 气缸盖密封垫

sealing gasket of cylinder cover

5 O型密封圈

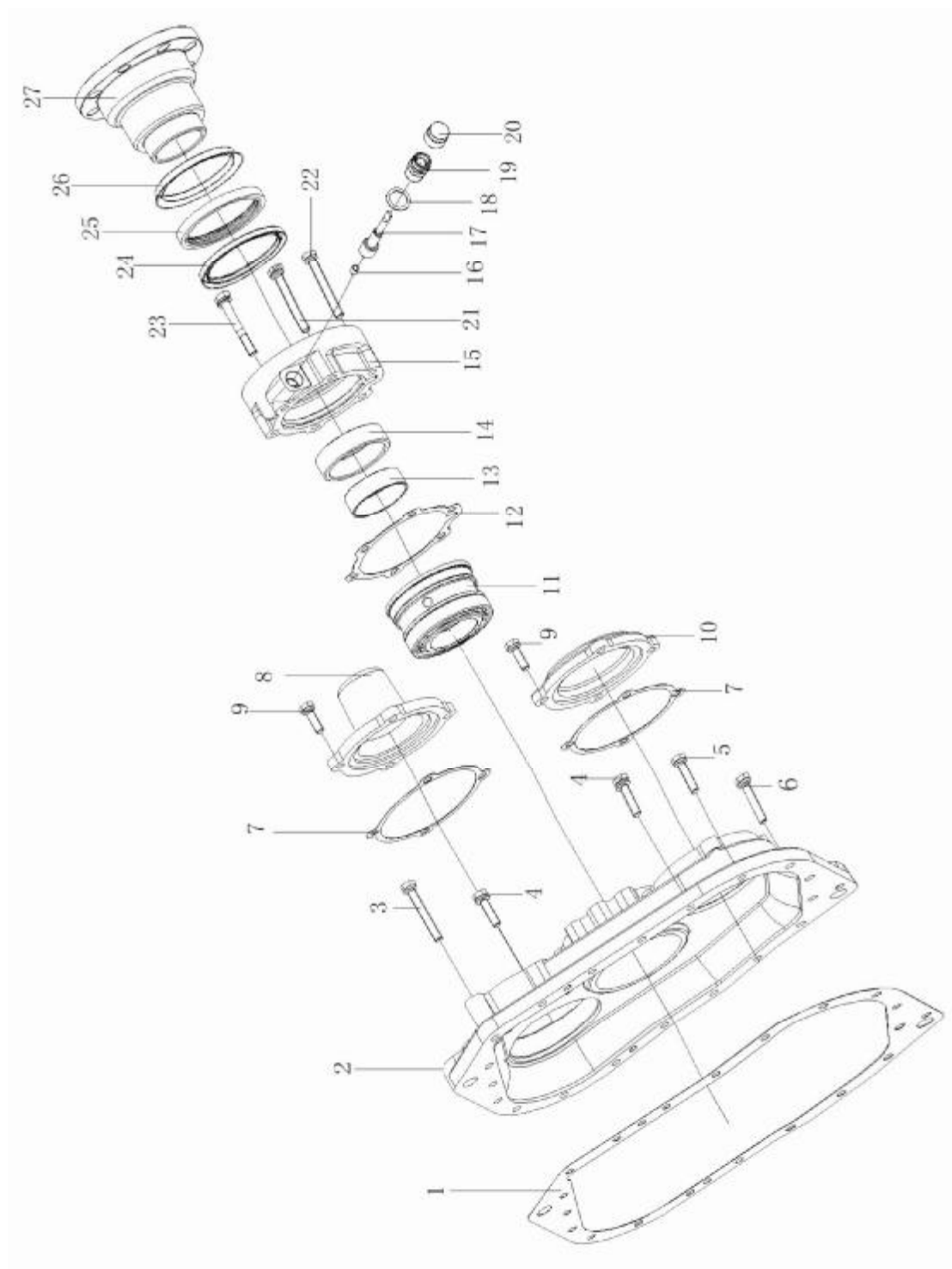
O sealing ring

6 钢球

steel ball

7 范围档气缸	cylinder piston of range speed
8 螺塞	bolt
9 范围档拨叉轴	yoke shaft of range speed
10 副箱换挡气缸盖	shift cylinder cover of aux. case
11 六角尼龙圈锁紧薄螺母	hex nylon fastening bolt
12 定位弹簧	locate spring
13 六角头螺栓	hex bolt
14 压力开关	pressure switch
15 皱褶铜垫圈	bronze gasket
16 副箱拨叉	yoke of auxiliary case
17 六角头头部带孔螺栓	hex bolt with hole on head

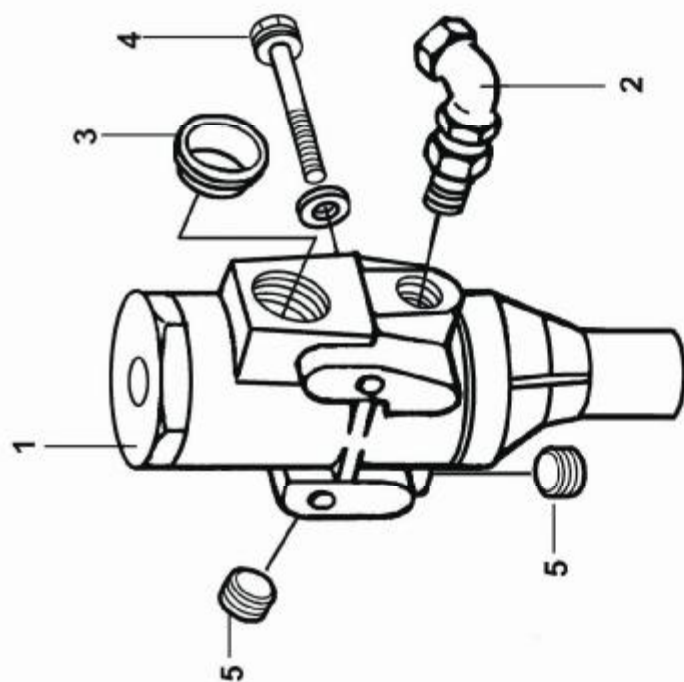
Section 12 rear cover assembly



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	14335	后盖衬垫	1	√	√	√	√	√	√	√	√	√
2	JS220-1707015	后盖壳体	1	√	√	√	√	√	√	√	√	√
3	F99975	六角头螺栓和弹簧垫圈组合件	4	√	√	√	√	√	√	√	√	√
4	Q1421075	小六角头螺栓 M10×50	5	√	√	√	√	√	√	√	√	√
5	Q1461050	六角头螺栓带垫圈和平垫圈组合件	2	√	√	√	√	√	√	√	√	√
6	Q1421040	六角头螺栓和弹簧垫圈组合件	11	√	√	√	√	√	√	√	√	√
7	GB5782-96	小六角头螺栓 M10×15	13	√	√	√	√	√	√	√	√	√
8	Q1421050	六角头螺栓和弹簧垫圈组合件	2	√	√	√	√	√	√	√	√	√
9	JS180-1707053	副轴中间轴衬套衬套	1	√	√	√	√	√	√	√	√	√
10	17352	副轴中间轴衬套	1	√	√	√	√	√	√	√	√	√
11	10S160-1707052	加长中间轴套	2	√	√	√	√	√	√	√	√	√
12	17376	螺栓总成	8	√	√	√	√	√	√	√	√	√
13	A-C09008	副轴中间轴衬套	1	√	√	√	√	√	√	√	√	√
14	JS180-1707052	副轴中间轴衬套	1	√	√	√	√	√	√	√	√	√
15	JS220-1707109	副轴衬套	1	√	√	√	√	√	√	√	√	√
16	717813	副轴衬套	1	√	√	√	√	√	√	√	√	√
17	JS180-1707156	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
18	15532	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
19	JS220-1707111	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
20	F91054	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
21	JS180-1707155	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
22	F99967	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
23	7992	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
24	F91055	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
25	F96005	垫片	1	√	√	√	√	√	√	√	√	√
26	F93060	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
27	X11412	副轴主轴承衬套	1	√	√	√	√	√	√	√	√	√
28	C09003	六角头螺栓带孔螺栓和弹簧垫圈组合件	1	√	√	√	√	√	√	√	√	√
29	GB32.1-88	六角头螺栓和弹簧垫圈组合件	4	√	√	√	√	√	√	√	√	√
30	Q1421075	小六角头螺栓 M10×50	5	√	√	√	√	√	√	√	√	√
31	GB5782-96	小六角头螺栓 M10×15	1	√	√	√	√	√	√	√	√	√
32	A-C09009	螺栓总成	1	√	√	√	√	√	√	√	√	√
33	C01032	主轴承衬套油封	1	√	√	√	√	√	√	√	√	√
34	21036	油封	1	√	√	√	√	√	√	√	√	√
35	F96119	防尘罩	1	√	√	√	√	√	√	√	√	√
36	JS220-1707159	输出法兰盘	1	√	√	√	√	√	√	√	√	√
37	F99912	输出法兰盘	1	√	√	√	√	√	√	√	√	√

1 后盖衬垫	rear cover gasket
2 后盖壳体	rear cover housing
3 六角头螺栓和弹簧垫圈组合件	hex bolt and spring gasket
六角头螺栓 M10 x 50	hex bolt M10 x 50
4 六角头螺栓弹簧垫圈和平垫圈组合件	gasket of hex bolt and flat ring
5 六角头螺栓和弹簧垫圈组合件	hex bolt and spring gasket
小六角头螺栓 M10 x 50	small hex bolt M10 x 50
6 六角头螺栓和弹簧垫圈组合件	hex bolt and spring gasket
7 副箱中间轴轴承盖衬垫	bearing cover gasket for countershaft, aux. case
8 加长中间轴盖	cover for lengthened countershaft
9 螺栓总成	bolt assembly
10 副箱中间轴轴承盖	bearing cover of countershaft, aux. case
11 圆锥滚子轴承	taper roll bearing
12 副箱主轴后轴承盖衬垫	bearing cover gasket of main shaft, aux. case
13 里程表主动齿轮衬套	drive gear bush of odometer
14 里程表主动齿轮	drive gear of odometer
15 输出轴后轴承盖	rear bearing cover of output shaft
16 里程表被动齿轮轴套	passive gear bush of odometer
17 里程表被动齿轮	passive gear of odometer
18 垫片	gasket shim
19 里程表接头总成	connector of odometer
20 里程表防护套	odometer lag
21 六角头头部带孔螺栓和弹簧垫圈组合件	hex bolt and spring gasket
22 六角头螺栓和弹簧垫圈组合件	hex bolt and spring gasket
23 螺栓总成	bolt assembly
24 主轴后轴承盖油封	oil seal of main shaft rear bearing
25 油封	oil seal
26 防尘罩	dust proof
27 输出法兰盘	output flange

Section 13 air filtration adjuster assembly



代号	零件号	零件名称	数量	12JS200T	12JS200TA	9JS150T-B	9JS135T-B	9JS119T-B	8JS100T-B	8JS100TA-B	8JS130T-B	8JS130TA-B
1	A-4740-1	空气过滤器	1	√	√	√	√	√	√	√	√	√
2	12845	90° 弯头	1	√	√	√	√	√	√	√	√	√
3	54015	CA密封垫片	1	√	√	√	√	√	√	√	√	√
4	1-20060	六角头螺栓和弹垫圈组合件	2	√	√	√	√	√	√	√	√	√
5	Q618B01	六角头密封垫圈	2	√	√	√	√	√	√	√	√	√

- 1 空气滤清调节器

2 90 度弯管接头

3 CA 碗型塞片

4 六角头螺栓和弹簧垫圈组合件

5 六角头锥形螺塞
- air filtration adjuster

90 degree pipe connector

bowl shape shim

hex bolt and spring gasket

hex taper bolt

Section 14 Single-H valve assembly

序号	零件号	零件名称	数量
1	7935	通气塞	2
2	12845	90度弯管接头	1
3	55511	气管总成	1
4	55512	气管总成	1
5	55521	气管总成	1
6	12JS160T-1703021	90° 快换接头	1
7	12JS160T-1703051	90° 弯管接头	1
8	12JS160T-1703052	单H阀	1
9	12JS160T-1702095	单H阀支座	1

- 1 通气塞

2 90 度弯管接头

3 气管总成

4 气管总成

5 气管总成

6 90 度快换接头

7 90 度弯管接头

8 单 H 阀

9 单 H 阀支座
- vent plug

90 degree bend pipe connector

air pipe assembly

air pipe assembly

air pipe assembly

90 degree quick shift connector

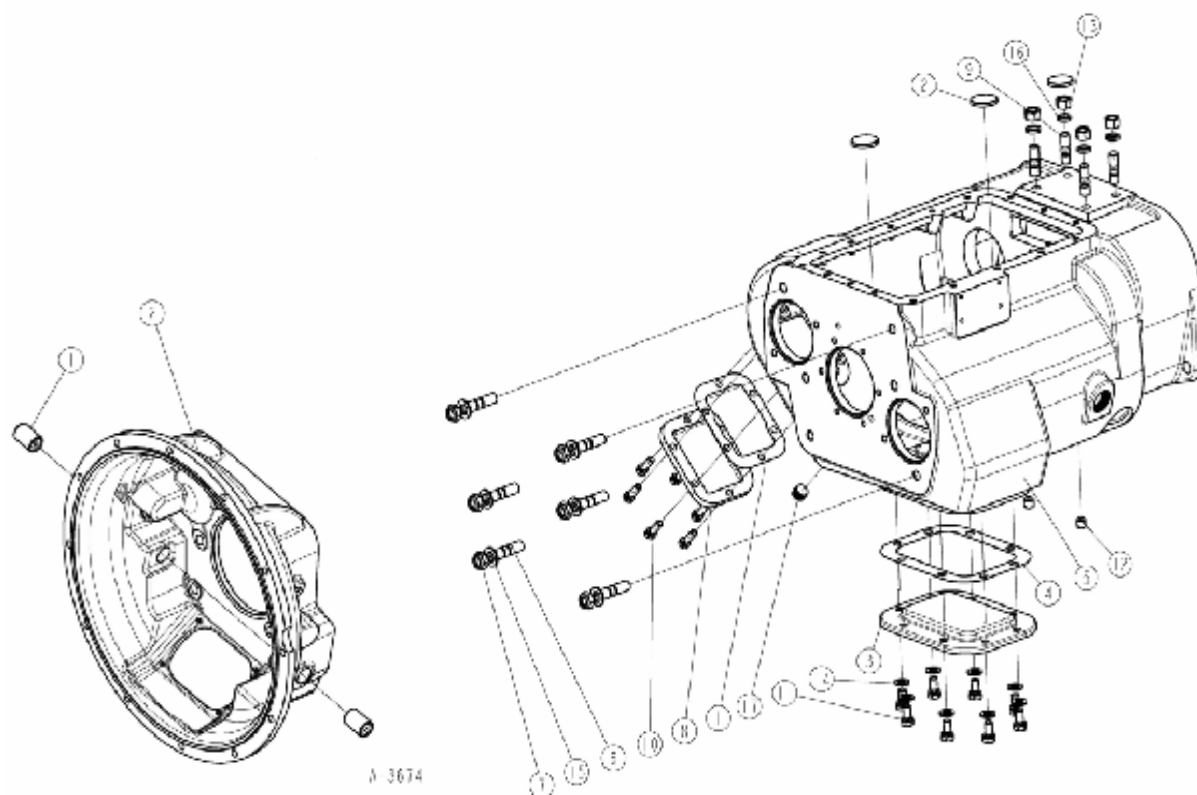
90 degree bend pipe connector

Single H valve

Single H pedestal

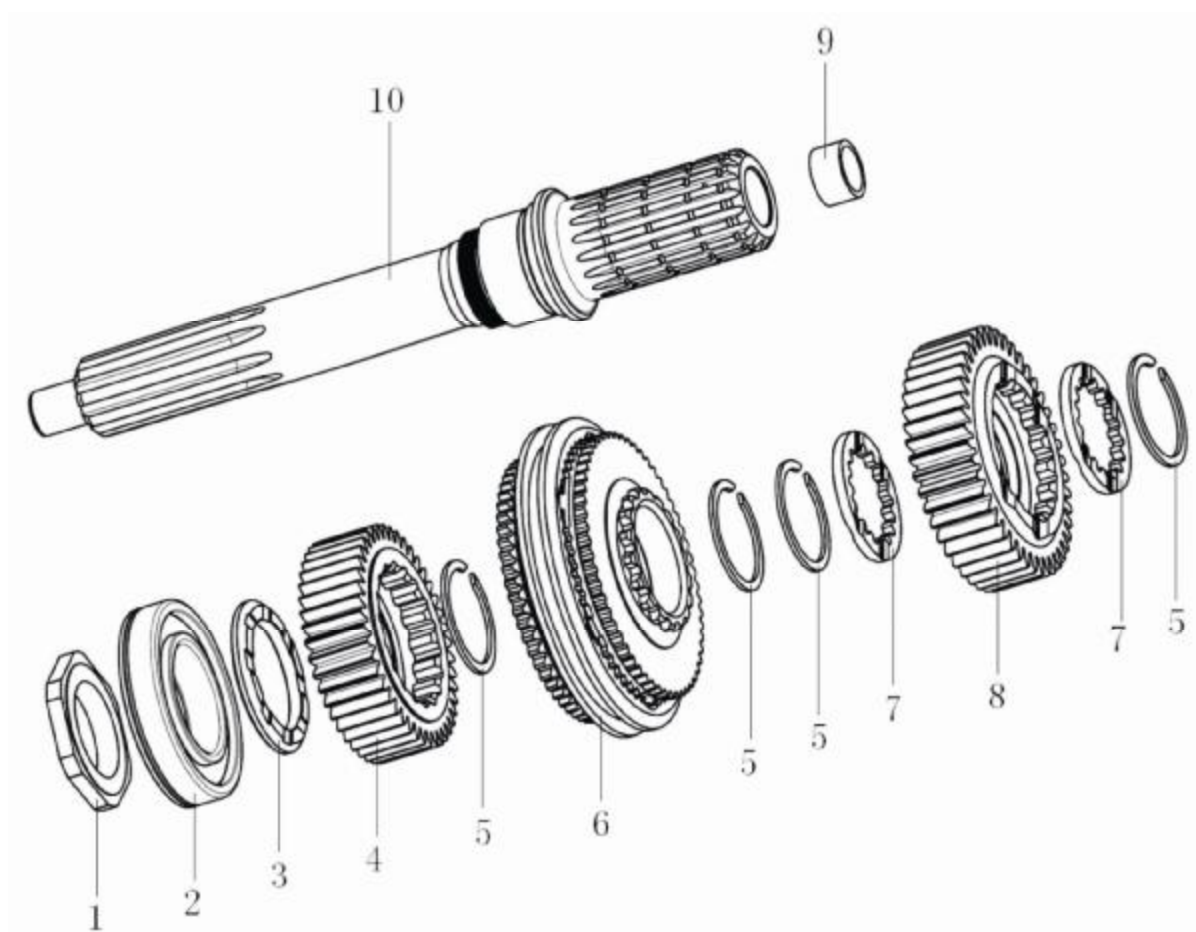
Section 15 Parts list of 16 speed transmission

离合器壳体和变速器壳体总成 Clutch housing and transmission housing assembly



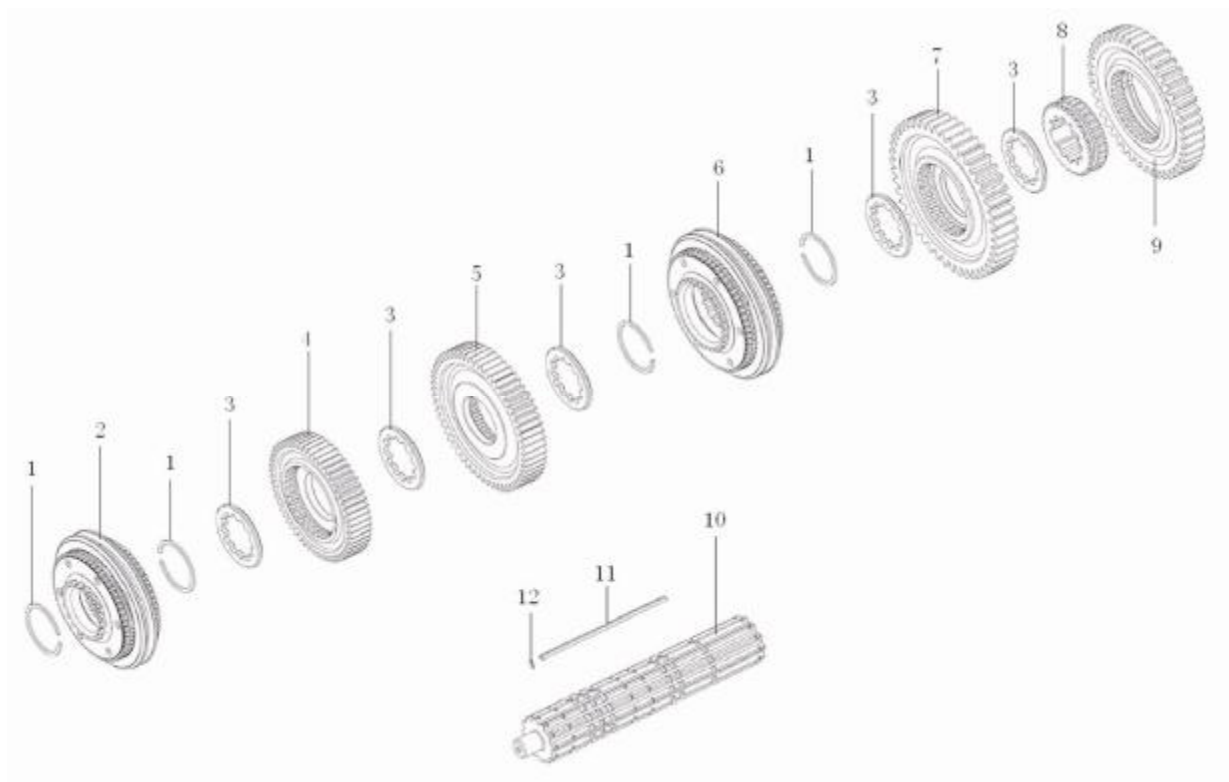
No.	Part No.	Description	Qty
1	1684	Gasket, side PTO opng	1
2	14373	Round magnetic-iron	3
3	16596	Cover, bottom PTO opng	1
4	16929	Gasket, bottom PTO opng	1
5	12JS160T-1701015	Transmission housing	1
6	C01056	Double head bolt	6
7	GB890-80-M16×1.5	Hex nylon locking thin nut	6
8	JS130T-1701020	Cover, PTO opng	1
9	Q1231630	Double head bolt	2
10	Q1421032	Hex bolt & spring washer combination	6
11	Q141225M	Pre-gumming hex bolt & spring washer combination	8
12	Q2821616	Flat holding screw with groove	2
13	Q341B16	Type 1 hex nut	2
14	Q40112	Flat washer	8
15	Q40116	Flat washer	6
16	Q40316	Spring washer	2
17	Q61304	Cone plug with groove	1

一轴总成 Input shaft assembly



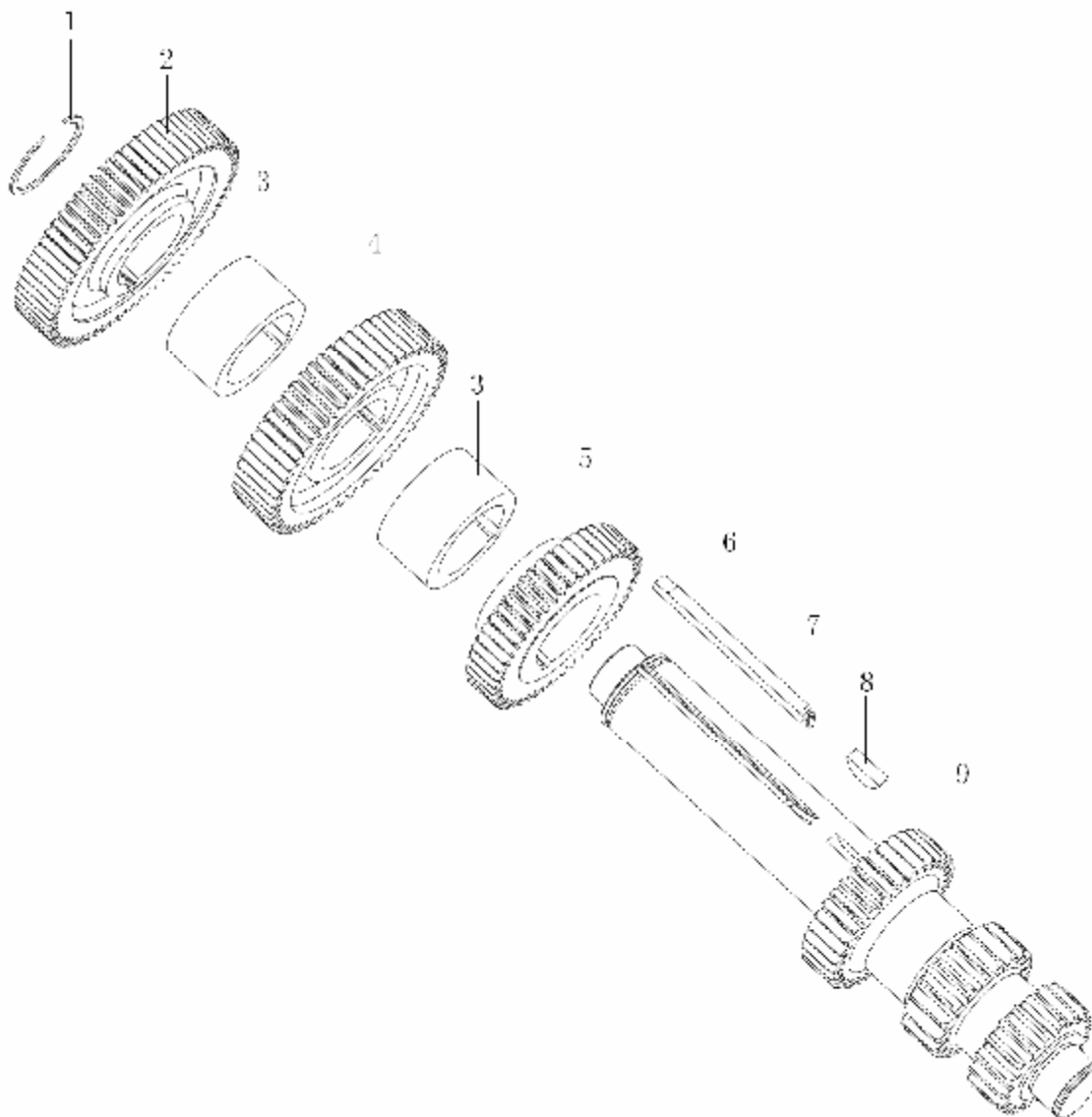
No.	Part No.	Description	Qty
1	8858	Nut, input shaft	1
2	150212K	Bearing, ball	1
3	16JS200T-1701036	Shim, input shaft	1
4	16JS200TA-1701032	Differential gear, input shaft	1
5	16763	Snap ring	4
6	16JS200T-1701040	Synchronizer assembly, Aux. case (Front)	1
7	16JS200T-1701034	Spline washer, input shaft gear	2
8	16JS200T-1701031	Gear, input shaft	1
9	JS125T-1701026	Guide sleeve, main shaft	1
10	16JS200T-1701030	Input shaft	1

二轴总成 main shaft assembly



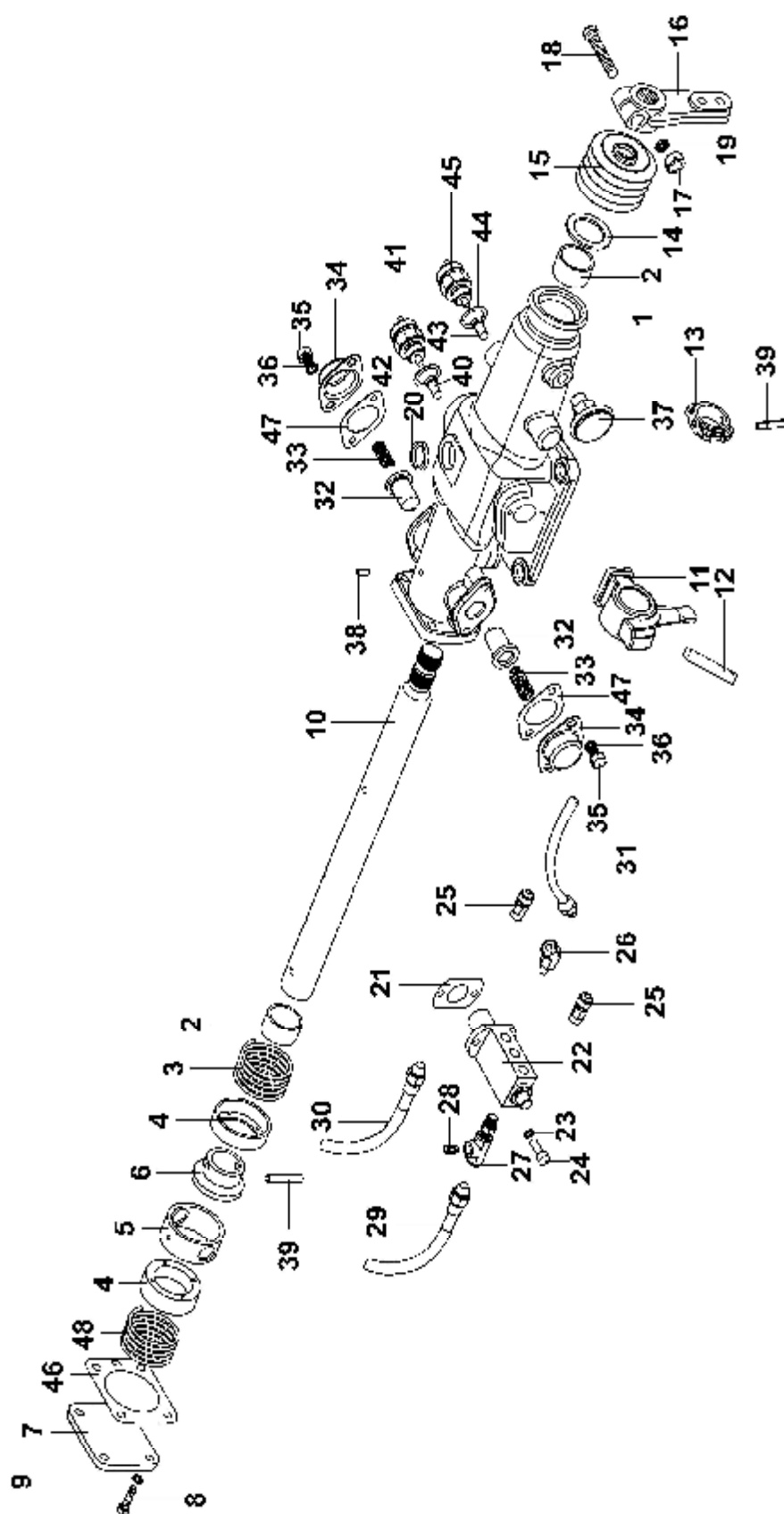
No.	Part No.	Description	Qty
1	9J200T-1701123	Snap ring	4
2	16JS200T-1701175	3 rd , 4 th synchronizer assembly	1
3	9JS200T-1701122	Washer, main shaft gear	5
4	16JS200T-1701113	3 rd gear, main shaft	1
5	16JS200T-1701112	2 nd gear, main shaft	1
6	9JS200T-1701170	1 st , 2 nd synchronizer	1
7	16JS200T-1701111	1 st gear, main shaft	1
8	16JS200T-1701108	Sliding sleeve	1
9	16JS200T-1701110	Reverse gear, main shaft	1
10	16JS200T-1701105	Main shaft	1
11	16JS200T-1701121	Long hex key, main shaft	1
12	Q5280310	Elastic cylindrical pin	1

中间轴总成 countershaft assembly



No.	Part No.	Description	Qty
1	19198	Snap ring, countershaft	1
2	16JS200TA-1701052	Differential gear, countershaft	1
3	12JS160T-1701057	Bushing	2
4	16JS200T-1701056	Driving gear, countershaft	1
5	16JS200T-1701050	3 rd gear, countershaft	1
6	16JS200T1701055	Square key, countershaft	1
7	Q5280514	Elastic cylindrical pin	1
8	X-6-E	Semicircular key	1
9	16JS200T-1701048	Countershaft	1

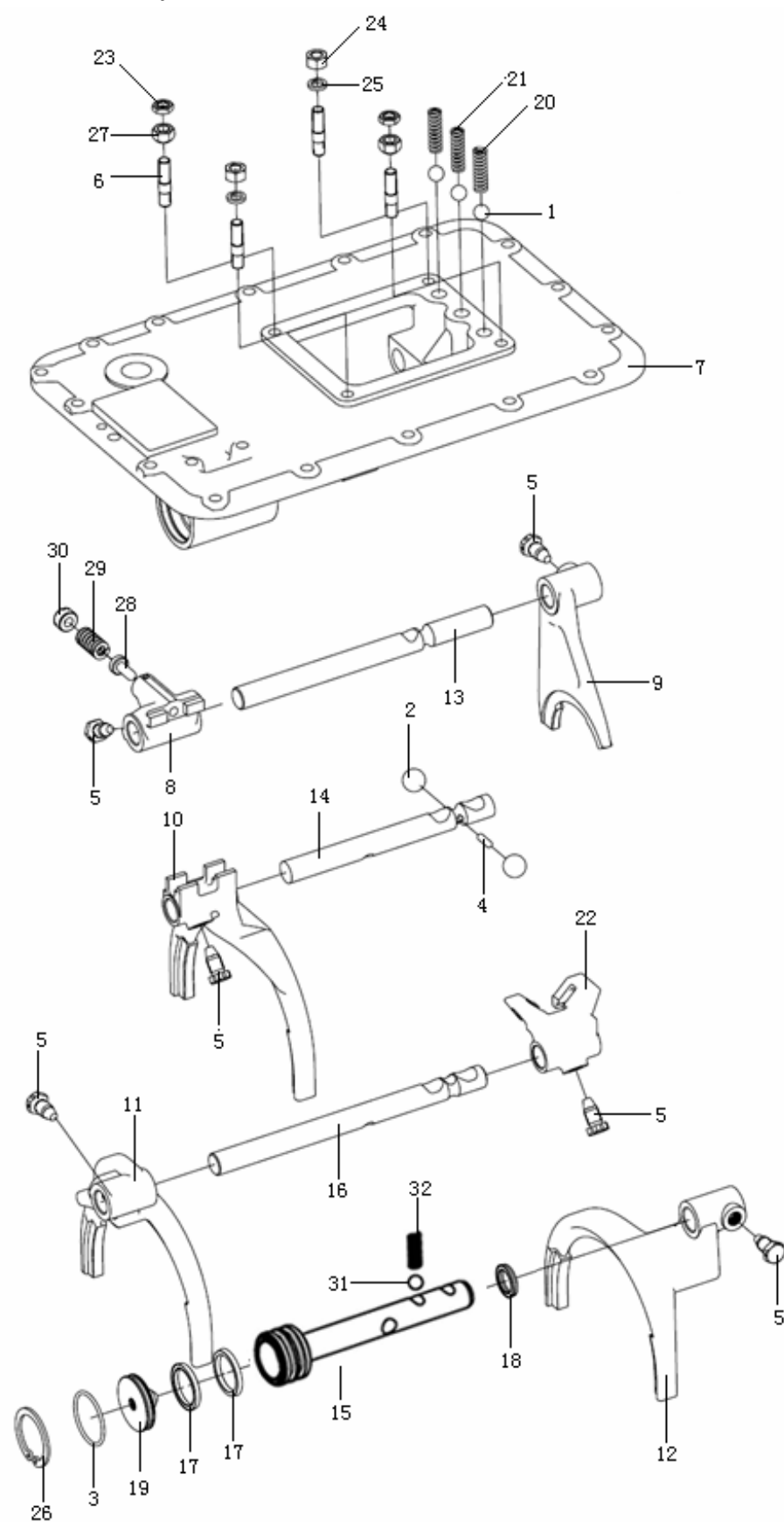
操纵装置总成 Control device assembly



No.	Part No.	Description	Qty
1	F96194	Double H control housing	1
2	F91345	Bushing, cross shift bar	2
3	F99983	Compression spring	2
4	F99673	Spring seat	2
5	F99674	Spring bushing	1
6	F99675	Location ring	1
7	F99666	Side plate	1
8	GB21-76	Small hex bolt M8×22	4
9	GB93-76	Spring washer 8	4
10	F99679	Cross shift bar	1
11	F99585	Shifting block	1
12	C03030	Cone pin	1
13	F99681	Control block, low-reverse speed	1
14	F91444	Oil seal	1
15	F99669	Sleeve	1
16	F96035	LRC external shift bar	1
17	GB51-76	Small hex nut M10×1	1
18	GB21-76	Small hex bolt M10×1×50	1
19	GB93-76	Washer 10	1
20	Q72224	Bowl patch	1
21	F91353	Gasket, double H valve	1
22	F99660	Double H valve	1
23	GB93-76	Spring washer 6	2
24	GB70-76	Inner hex bolt M6×18	2
25	7935	Breather plug	2
26	12880	45° angular pipe union	1
27	C03052	Tee union	1
28	Q618B01	Hex cone plug	1
29	55518	Air pipe assembly	1
30	55518	Air pipe assembly	1
31	55528	Air pipe assembly	1
32	F99670	Location pin	2
33	F96037	Compression spring	2
34	F96141	Spring gland cover	2
35	GB21-76	Small hex bolt M8×22	4
36	GB859-76	Spring washer 8	4
37	15276	Breather plug	1
38	C03004	Stop bolt	1
39	C09035	Pin 6×36.5	1
40	F99702	Pin, neutral switch	1
41	990.12.71.0041	Pressure switch	1

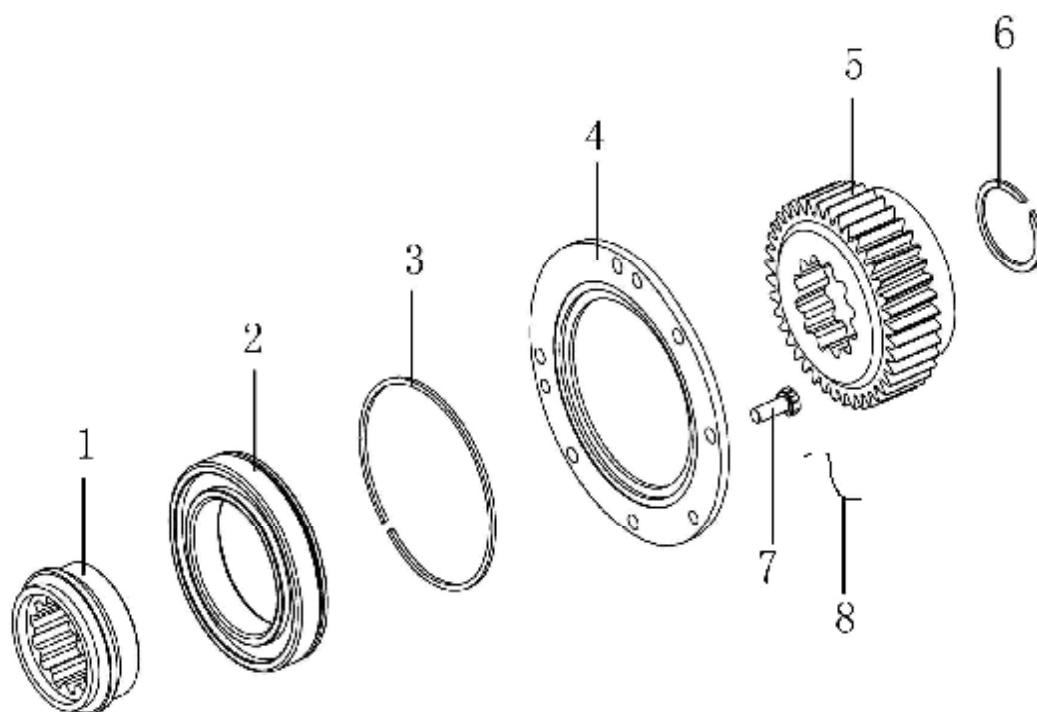
No.	Part No.	Description	Qty
42	Q72318T3	Gasket, seal	1
43	15899	Switch starting pin	1
44	C03015	Gasket, seal	1
45	791.00.71.0068	Pressure switch	1
46	F99672	Gasket	1
47	F96140	Gasket	2
48	F96036	Compression spring	1

上盖总成 Shift bar assembly



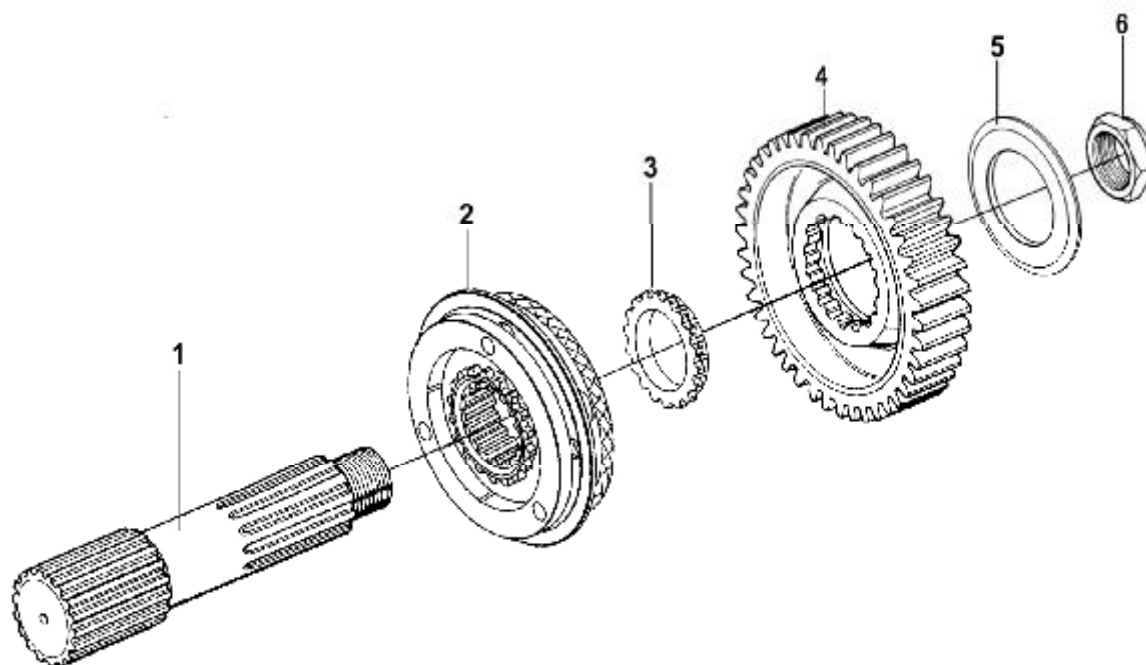
No.	Part No.	Description	Qty
1	12.7G100BGB-T308	Steel ball	4
2	19.05G100BGB-T308	Steel ball	2
3	GB3452.1-54.5X2.65G	O-ring	1
4	1634	Interlocking latch, york shaft	1
5	3220	Locking bolt, shifting york	6
6	11066	Double head bolt	4
7	16JS200T-1702015	Shift bar	1
8	16JS200T-1702051	Guide sleeve assembly, reverse speed	1
9	16JS200T-1702055	York, reverse speed	1
10	16JS200T-1702056	1 st , 2 nd york	1
11	16JS200T-1702057	3 rd , 4 th york	1
12	16JS200T-1702058	York, front Aux. case	1
13	16JS200T-1702063	York shaft, reverse speed	1
14	16JS200T-1702064	1 st , 2 nd york shaft	1
15	16JS200T-1702065	Yoke shaft, piston	1
16	16JS200T-1702066	3 rd , 4 th yoke shaft	1
17	16JS200T-1702067	Y-seal ring	2
18	16JS200T-1702068	Y-seal ring	1
19	16JS200T-1702069	Cover	1
20	F96084	Compression spring	1
21	F96085	Compression spring	2
22	F99589	3 rd , 4 th , 7 th , 8 th guide block	1
23	Q351B10	Hex thin nut	2
24	Q361B10	Type 2 hex nut	2
25	Q40310	Spring washer	2
26	Q43048	Circlip for hole	1
27	X-1-603	Hex nut	2
28	16JS200T-1702061	Locking plug, reverse speed	1
29	8774-1	Locking spring, reverse speed	1
30	8968	Locking plug screw, reverse speed	1

副箱驱动齿轮总成 Drive gear assembly, Aux case



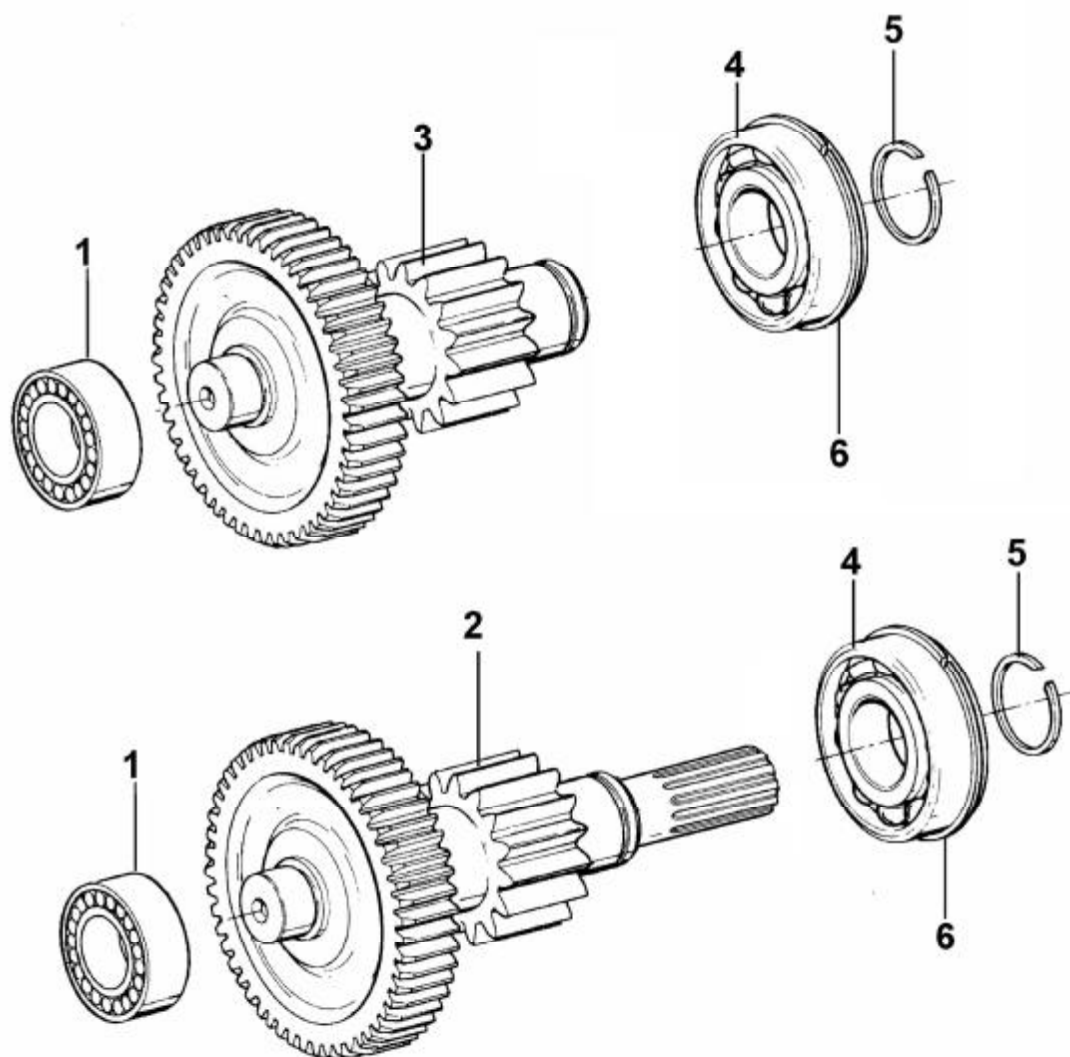
No.	Part No.	Description	Qty
1	9JS200T-1701126	Bearing seat	1
2	50118	Ball bearing	1
3	C01019	Snap ring	1
4	JS220-1707031	Bearing location plate, Aux. case	1
5	16JS200T-1707030	Driving gear, Aux. case	1
6	9JS200T-1701123	Snap ring	1
7	C09032	Hex bolt with hole of head	6
8	1819	Iron wire	According to requirements

副箱主轴总成 main shaft assembly, auxiliary case



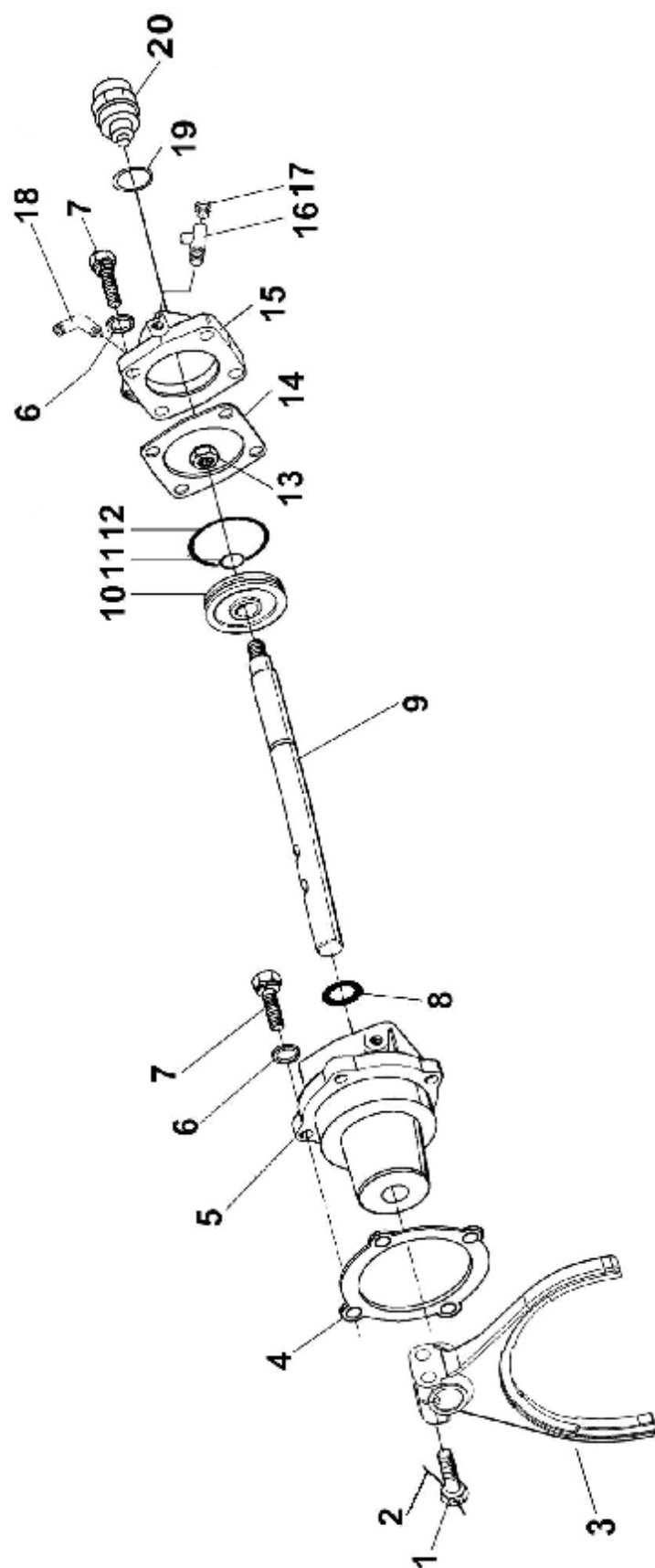
No.	Part No.	Description	Qty
1	12JS200T-1707105	Main shaft, Aux. case	1
2	12JS160T-1707140	High-low speed synchronizer assembly	1
3	12JS160T-1707107	Spacer, main shaft, Aux. case	1
4	16JS200T-1707106	Reducing gear, main shaft, Aux. case	1
5	16JS200T-1707108	Pressure plate, main shaft gear, Aux. case	1
6	F96006	Nut, flange	1

副箱左右中间轴总成 Left & right countershaft, Aux. case



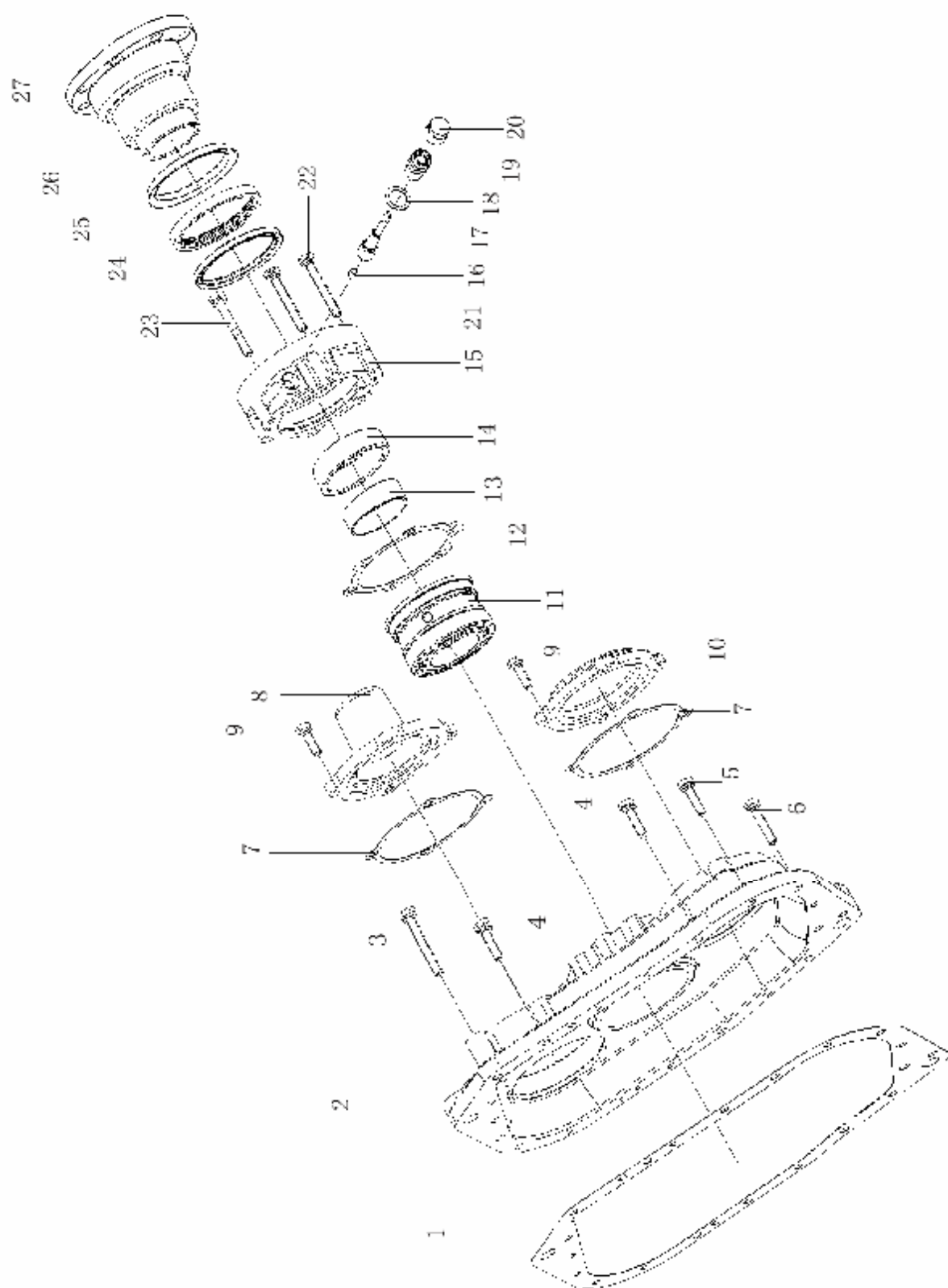
No.	Part No.	Description	Qty
1	42308E	Short cylindrical roller bearing	2
2	16JS200T-1707047	Lengthened welding countershaft assembly, Aux. case	1
3	16JS200T-1707050	Welding countershaft assembly, Aux. case	1
4	192311E	Short cylindrical roller bearing	2
5	GB305-82	Snap ring	2
6	JS180-1707051	Snap ring	2

副箱气缸总成 Cylinder assembly, Aux. case



No.	Part No.	Description	Qty
1	Q171B1250	Hex bolt with hole of head	2
2	1819	Iron wire	According to requirements
3	16775	Yoke, Aux. case	1
4	14347	Gasket, seal	1
5	16778	Air cylinder, range speed	1
6	GB93-76	Spring washer 10	8
7	GB21-76	Small hex bolt M10×32	8
8	14765	O-ring, seal	1
9	JS220-1707061	Yoke shaft, range speed	1
10	14341	Piston, air cylinder, range speed	1
11	14345	O-ring, seal	1
12	14344	O-ring, seal	1
13	GB890-80	Hex nylon locking thin nut M16×1.5	1
14	14349	Seal gasket, air cylinder cover	1
15	F99857	Shifting speed air cylinder cover, Aux. case	1
16	C03052	Tee union NPT1/8	1
17	Q618B01	Square head cone plug NPT 1/8	1
18	12880	45° angular pipe union	1
19	X11511	Folding copper washer	4
20	791.00.71.0069	Pressure switch	1

后盖壳体总成 rear cover housing assembly



No.	Part No.	Description	Qty
1	14335	Gasket, rear cover	1
2	JS220-1707015	Housing, rear cover	1
3	Q1421075	Hex bolt & spring washer combination	4
4	Q1461050	Spring washer of hex bolt & plain washer combination	2
5	Q1421040	Hex bolt & spring washer combination	11
6	Q1421050	Hex bolt & spring washer combination	2
7	JS180-1707053	Gasket, countershaft cover, Aux. case	2
8	10JS160-1707052	Cover, lengthened countershaft	1
9	A-C09008	Bolt assembly	8
10	JS180-1707052	Bearing cover, countershaft, Aux. case	1
11	JS220-1707109	Cone roller bearing	1
12	JS180-1707156	Gasket, rear bearing cover, mainshaft, Aux. case	1
13	JS220-1707111	Bushing, speedometer drive gear	1
14	F91054	Speedometer drive gear	1
15	JS180-1707155	Rear bearing cover, output shaft	1
16	7992	Axle bushing, speedometer driven gear	1
17	F91055	Speedometer driven gear	1
18	F96005	Gasket	1
19	F93060	Joint assembly, speedometer	1
20	X11412	Shield, speedometer	1
21	C09033	Hex bolt, with hole of head & spring washer combination	1
22	Q1421075	Hex bolt & spring washer combination	4
23	A-C09009	Bolt assembly	1
24	C01032	Oil seal, rear bearing cover, main shaft	
25	19109	Oil seal	1
26	F96119	Dust-proof	1
27	JS220-1707159	Flange, output	1

空气滤清调节器和螺塞总成 Air filtrating regulator & plug screw assembly

